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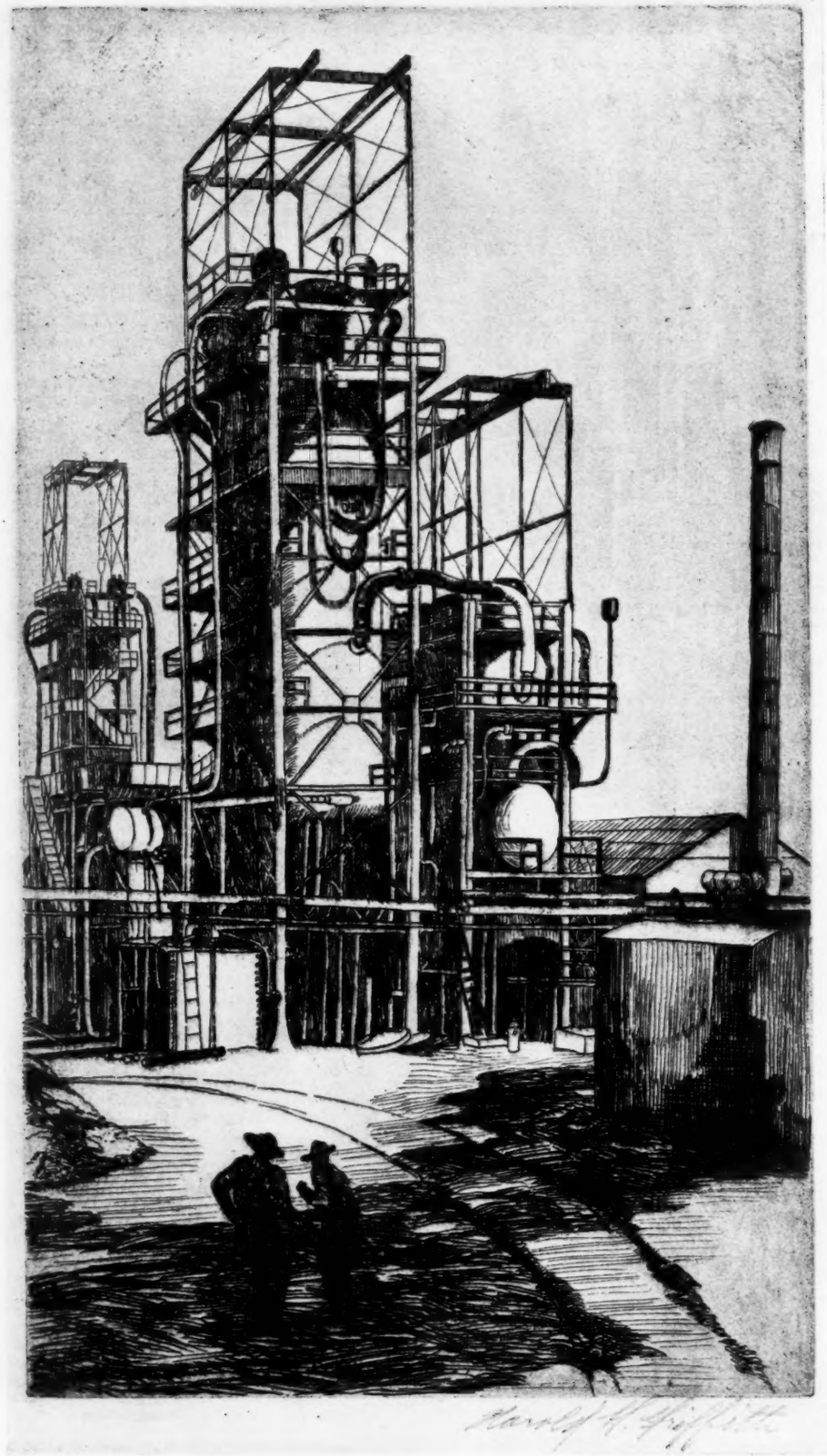

Towers in a Modern Refinery

by H. G. Griffith

From an Etching
in the Collection of
The Guardian Trust Co.
Cleveland, Ohio

NEW YORK • # WORLD PETROLEUM • LONDON

Dislocated Economics

DISLOCATED ECONOMICS is Walter Teagle's diagnosis of the advance in crude prices last year coincidently with the below-average prices of gasoline. This is the mostly aptly descriptive term yet applied to the oil industry's chronic malady. The actual conjunction of words used by the president of the Standard Oil Co. of New Jersey in the annual report of the company is: That this lower price range (of gasoline) existed during a year in which crude prices were advanced indicated the dislocation of the industry's economics." In order that there may be no mistake about his meaning he continues a little further: "The theory that the price of gasoline may be artificially held to maintain a fixed value for the crude has been proven to be economically unsound." And finally Walter Teagle aligns himself squarely with sound economics by definitely asserting his view: "The price the consumer pays for the product depends entirely on the margin between supply and dominant demand and must inevitably influence the value of the raw material." The Law of Supply and Demand cannot be gainsaid.

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From Coal to Oil

ADDITION of Great Britain's powerful chemical combine to the union of the Standard Oil Co. of New Jersey with the I. G. Farbenindustrie A. G. for the development of the hydrogenation process emphasises the great national importance of this system to coal countries. The British firm, Imperial Chemical Industries, Ltd., has been producing high grade gasoline from coal in an experimental plant. The German company of course is currently producing gasoline from coal on a commercial scale. The American company has been converting crude 100 per cent into gasoline. By the pooling of knowledge and by mutual co-operation the three powerful companies advance their practical and commercial progress, and they avoid duplication of effort and conflict of patents. Eventually hydrogenation will produce changes of a fundamental nature in the oil traffic of the world. Manufacture of liquid hydro carbons holds a great interest for coal countries, because it will develop national resources, establish a new industry, provide security of supply and reduce imports, four factors that make an appeal in every land.

Deprecating Imperialism

SIR JOHN CADMAN'S recent deprecation of oil imperialism was not as stirring as the phrases in which the head politicians of Great Britain, France and the United States roused their nations to a conception of a world fighting for oil. Yet it is appropriate that the chairman of the Anglo-Persian Oil Co. should be the first to correct his nation's viewpoint, for it was that company, as a foundling adopted by the Lord Fishers and Winston Churchills, which threw oil into the imperialist arena. Referring back to the end of the war, Sir John Cadman said: "Hence there ensued a great scramble for oil and for control of the sources of oil production, which affected not only what is known as 'big business,' but also many Foreign Offices and Stock Exchanges, and it has taken something like 9 or 10 years for the world at large—as distinct from the official specialist—to realize that the correct standpoint from which to view the problems, and on which to base a sensible policy, is that of a world presumed to be desirous of promoting international peace, and occupied with pacific questions of friendly relations, economic exchange, and industrial development."

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France and Iraq Oil

FRANCE, like every other country, exhibits a division of political views. French opinion is not unanimous on the political problem it has made of petroleum. France is apparently united, however, in the aspiration to make the Iraq oilfield development subservient to French national control of shipments. It is on this very point that the partners in the Iraq Petroleum Co., Ltd., find themselves in disagreement. The very delay due to insistence of the French on the Syrian route for the pipe line—in order to bring it under French political, if not military, control—stimulates the opposition of the Dutch, British and American partners. Politics in domination of business are a commercial hazard that few business men care to accept. As between British control and French control of the pipe line route from Baba-Gurgur to the Mediterranean, the choice of the private and independent partners lies with the former, because British politics generally bow to business. The Palestine outlet promises commercial freedom and security, which more than offset the extra cost of the longer pipe line it entails.

World Oil Production · April 1930

RUSSIA exhibited last month a further increase of production. At the April rate her annual production would be 17½ million tons (over 120,000,000 bbl.). At this rate she has probably surpassed Venezuela, but the lack of official figures from the Caribbean republic during the last couple of months prevent definite confirmation hereof.

Rumania is now producing more petroleum than either Persia or Mexico and during April actually equalled the total of the Netherlands East Indies with Sarawak. Her April advance has restored her monthly rate of production close to her pre-war figure.

These tendencies are quite definitely established, and one can expect Russia to keep forging ahead, while Rumania will endeavor to keep her production above the level of half-a-million tons per month.

Venezuela will probably cut back her production until the ratio with last year's figure is about in the same proportion as the current rate in the United States bears to last year's rate. The opening of the Eastern Venezuelan fields later will probably turn the country's total upward again, because the production in that area is not for the same companies that are restricting in the Maracaibo Basin, where operations are now being organized with a view to permanency of production.

		April, 1930	April, 1930
United States	A. P. I.	*77,018,100 bbl.	11,002,586 tons m.
Venezuela		.. .. .. bbl.	.. .. .. tons m.
Russia	official	10,221,036 bbl.	*1,460,148 tons m.
Neth. E. Indies & Sarawak[1]	private	3,570,000 bbl.	*510,000 tons m.
Rumania	official	3,570,000 bbl.	*510,000 tons m.
Persia	estimate	3,500,000 bbl.	500,000 tons m.
Mexico	official	*3,319,303 bbl.	474,186 tons m.
Colombia	official	*1,645,242 bbl.	235,035 tons m.
Peru	official	*1,100,735 bbl.	157,248 tons m.
Trinidad	official	*790,568 bbl.	112,938 tons m.
Argentina	estimate	726,600 bbl.	103,800 tons m.
India—British	estimate	602,000 bbl.	86,000 tons m.
Poland	official	375,900 bbl.	*53,700 tons m.
Japan and Taiwan	private	168,000 bbl.	*24,000 tons m.
Egypt[2]	private	152,705 bbl.	21,815 tons m.
Ecuador	official	*139,486 bbl.	19,927 tons m.
Sakhalin	estimate	105,000 bbl.	*15,000 tons m.
Canada	estimate	*105,000 bbl.	15,000 tons m.
Others†	estimate	175,000 bbl.	25,000 tons m.

† Germany, Iraq, France, Czecho-Slovakia, etc.
* Measure used in official returns; conversions uniformly at 7 barrels per ton.
[1] Sarawak separately about 59,750 tons m. (418,250 bbl.) [2] Anglo-Egyptian Oilfields, Ltd.

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World Oil Production · March 1930

RETURNS for the month of March are printed again, with the inclusion of official returns from Rumania, Colombia and Peru and a corrected figure from Mexico. The official Venezuelan total is still missing, no official figures having been obtainable from Venezuela since the February total was published. It is therefore still impossible to give the March total of crude oil production on the standard basis practised by World Petroleum since the beginning of this year.

Rumania's official total for the month of March already indicated an increase that became more marked in the month of April, as noted under that month above. Colombian and Peruvian production, being pretty well stabilized, showed no change. The increases of Russia and Trinidad were the most marked of the month, the latter having been unforeseen, though the former was scheduled by the Soviet program.

		March, 1930	March, 1930
United States	A. P. I.	*78,865,400 bbl.	11,266,486 tons m.
Venezuela		.. .. .. bbl.	.. .. .. tons m.
Russia	official	9,653,000 bbl.	*1,379,000 tons m.
Neth. E. Indies & Sarawak[1]	private	3,691,800 bbl.	*527,400 tons m.
Persia	estimate	3,608,710,bbl.	515,530 tons m.
Mexico	official	3,490,434 bbl.	498,633 tons m.
Rumania	official	3,360,000 bbl.	480,000 tons m.
Colombia	official	1,778,202 bbl.	254,029 tons m.
Peru	official	1,098,635 bbl.	156,948 tons m.
Trinidad	official	*815,339 bbl.	116,477 tons m.
Argentina	estimate	749,070 bbl.	107,010 tons m.
India—British	estimate	619,500 bbl.	88,500 tons m.
Poland	official	378,000 bbl.	*54,000 tons m.
Japan and Taiwan	private	174,300 bbl.	*24,900 tons m.
Egypt[2]	private	163,436 bbl.	23,348 tons m.
Ecuador	official	*142,817 bbl.	20,402 tons m.
Sakhalin	estimate	108,500 bbl.	*15,500 tons m.
Canada	estimate	*99,634 bbl.	14,233 tons m.
Others†	estimate	175,000 bbl.	25,000 tons m.

† Germany, Iraq, France, Czecho-Slovakia, etc.
* Measure used in official returns; conversions uniformly at 7 barrels per ton.
[1] Sarawak separately about 63,000 tons m. (441,000 bbl.) [2] Anglo-Egyptian Oilfields, Ltd.

The Law of Diminishing Returns

By J. Elmer Thomas, Fort Worth, Texas, Petroleum Analyst, Fenner & Beane, and by Frederick S. Todman, New York, Economist and Certified Public Accountant

DURING the last few years the oil industry has come to understand that also its operations must finally be governed by the Law of Supply and Demand. When one considers the nature of the business and its leaders the difficulty and delay in the acceptance of that law is not hard to understand. Prospecting for a natural resource developed pronounced individualists of the pioneer type. Vast improvements in refining technology brought some quick fortunes to the most successful. Steady and certain increase in consumption almost submerged competition in the fast expanding market. The exigencies of individual positions rather overshadowed the economics of the aggregate situation.

Steady pressure of inexorable laws manifested itself as soon as surplus supply proved to be more than a temporary incident. In the past three years the modern oil business, young in years but a giant in stature, has recognized the importance of balancing Supply and Demand. The necessity was pressing, the advantage obvious, and it seems safe to predict that the lesson will not be forgotten. The next step must be to realize the importance of the Law of Diminishing Returns, and adopt its dictates. This should follow as a natural sequence.

"There is a stage beyond which further capital expenditures not only do not produce an additional commensurate return, but also tend to reduce the current rate of return from present capital investments."

We submit that the oil industry already has reached that stage in its producing, manufacturing and distributing branches. That there now are too many oil wells, too many stills and too many filling stations, must be acknowledged by every thoughtful student of the oil business. This demonstrates that too much money is invested in the business.

There is no visible tendency to reduce the capital being utilized by the oil industry. Many small individual oil operators are becoming important units. Many minor corporations are integrating and expanding to become major organizations. And most of the large companies are engaged in expansion programs to make them still larger. The industry as now constituted is over-built by perhaps 50 per cent and, should all the ambitious plans of the individual units be carried out, in the aggregate its surplus construction would soon be increased to some 100 per cent.

This expansion has been permitted by new funds secured from the public and by the reinvestment of large surplus credits, accumulated by paying stockholders only a meager return on their securities. All during the protracted bull-market the oil issues were not a favored group, and yet one company has secured a total of $300,000,000 new financing from the public in the last few years. Just a few months ago another company sold $100,000,000 in notes to be used for an expansion program. In those two cases the new operations will probably be intelligent and successful, but should all companies embark upon comparable programs all of this expansion would be unprofitable. Who is to decide which units are to expand notably and which companies are to be deprived of their proportionate share of present business?

From 1916 to 1921 the industry was hard pressed to keep an assured supply in sight sufficient to meet the rapidly increasing demand. From 1922 to 1926 the same mad scramble for expansion continued, although there was never a hint of shortage. Since 1927 the problem very definitely has been to hold production down to consumption requirements. With the very large reserves—drilled, proven or indicated—now in sight, with important new fields being discovered almost every week and with vastly increased ability to locate additional deposits, there appears to be little necessity at present for the industry to expand in the producing branch.

In refining operations there has always been a conflict over the question whether refineries should be built close to the raw material and products shipped to consuming areas or whether crude should be transported to refining centers located close to the markets. Both methods have been followed in part, and as a result refinery capacity far beyond marketing demand has been constructed. New and improved methods have been developed constantly and have only contributed to excessive plant construction. Here again there is, and can be, no control over the decisions of any unit to expand its facilities, but in the aggregate there must be restraint if the industry is to prosper.

"THE NEXT STEP must be to realize the importance of the Law of Diminishing Returns, and adopt its dictates. This should follow as a natural sequence.

'There is a stage beyond which further capital expenditures not only do not produce an additional commensurate return, but also tend to reduce the current rate of return from present capital investments.'

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The duplication of marketing facilities has reached almost the point of absurdity. Due originally to many new organizations offering products on a weakened spot market, independent distributors were quick to take advantage of the wide margins below retail prices, the latter being fairly well maintained by the integrated companies. Service stations were built and pumps installed in such numbers that their average individual daily sales were ridiculously small. This increased sharply the distributing expense and served to maintain the wide margin between wholesale and retail prices.

The next development was a mass invasion of the marketing field by all refiners who lacked a fixed outlet for their products. Many independent jobbers and retailers were bought out, but many additional filling stations were built. Had less capital been available for such expenditures there would of necessity have been more mergers and consolidations, presumably far more efficient and economical than the recent and present programs.

Consumption of petroleum products continues to show a steady increase, though at a decelerated rate, and for the purposes of this discussion it may be said to indicate an overall expansion of from 8 per cent to 12 per cent annually. The exact figure makes little difference, but if it be placed at 10 per cent, for example, it is obvious then that neither the producing, refining nor marketing branches should be expanded more rapidly than 10 per cent. This principle, however, has not been followed by the industry in the aggregate nor by its component units.

A study of earnings statements and balance sheets over a period of years illustrates this point very clearly. In the tables below we have taken for examples a large company of the Standard group, a large independent company, a small unit of the Standard group, and a small independent, all companies being integrated and not confined to merely one or two branches of the business. Consolidated statistics are for those four representative companies.

The five years for which data were used, 1925-1929 inclusive, comprise periods favorable, unfavorable and doubtful. They cover times of temporary crude shortage, times of serious over-production and times when fair success was attained in balancing output with consumption. They offer a fair measure of the conditions which may be anticipated for the next several years.

An analysis of the Accumulated Reserve account shows that liberal charge-offs have been made, the five year average for Accumulated Reserves being 42.78 per cent of the Undepreciated Property account. The annual reserves for Exhaustion (including depletion, depreciation, etc.), averaged 15.73 per cent of the net Property Account, but these charges show a definite tendency to increase, the last two years having been 17.5 per cent.

Emphasis must be laid upon the liberality of these reserves when consideration is given to the surplus funds available for expansion under policies now being followed. Presuming that capital has been invested advantageously in the purchases it naturally follows that the Property Account is being extinguished far more rapidly than the actual exhaustion of the assets demands or requires.

Even after these heavy charges to depletion it is significant that 39 per cent of Earnings are now being paid out as Dividends and 61 per cent of Earnings carried to Surplus, although the successful reinvestment of those funds—with all branches of the industry obviously over-expanded—would seem to be in direct violation of the Law of Diminishing Returns stated on the previous page.

During the past few years each of these four companies in its particular class has placed itself in a position to expand more rapidly than could the entire industry. Each has succeeded in doing so, and yet it may be suggested that their success has, both directly and indirectly, harmed the industry as a whole and themselves individually. A continuance of such a policy—with a definite and perhaps permanent over-supply of crude and over-expansion of refining and distributing facilities—might prove fatal to stability and control.

Normal expansion and steady improvement afford a more permanently attractive outlook for the oil companies. Aggressive efforts to gain more than their share of business may produce the desired result,

Table I. Consolidated Record of Four Companies

(Figures are in millions of dollars)

	1925	1926	1927	1928	1929	Average
Undepreciated Property Account	704.0	824.3	932.5	962.9	1,054.7	895.7
Accumulated Reserves	286.5	335.5	398.7	405.0	437.0	372.5
Net Property Account	417.5	488.8	533.8	557.9	617.7	523.1
Net Working Capital	212.1	254.6	264.2	350.4	339.1	284.1
Gross Income	400.7	451.4	503.3	570.1	618.3	509.3
Operating Income	186.7	201.6	162.5	253.8	289.4	218.8
Exhaustion (including Depletion, Depreciation, etc.)	56.0	68.0	87.4	91.4	108.2	82.2
Net Profits	113.1	112.5	53.2	138.0	161.5	115.7
Dividends Paid	31.7	43.9	45.1	46.4	62.9	46.0
Carried to Surplus	81.4	68.6	8.1	91.6	98.6	69.7

Table II. Relationship of Major Items

Expressed (in percentages)

	1925	1926	1927	1928	1929	Average
Ratio of Cumulative Reserves to Original Property Account	46.96	40.70	42.75	42.06	41.43	42.78
Ratio of Annual Reserves for Exhaustion to Net Property Account	13.41	13.91	16.37	17.46	17.52	15.73
Ratio of Exhaustion to Net Operating Income	30.00	33.73	53.41	36.01	37.39	38.11
Ratio of Dividends to Earnings	28.03	38.98	84.77	33.62	38.94	44.87
Ratio of Surplus to Earnings	71.97	61.02	15.23	66.38	61.06	55.13
Ratio of Surplus to Property Account	19.50	14.03	1.51	16.42	15.96	13.48

but only at too great a cost, and the added increment not only may be unprofitable but may also reduce, if not destroy, the profits from present operations. A more liberal dividend distribution would help to correct the situation described and such a policy might prove beneficial to each company.

From the stockholders this program would meet with few objections. For many years their earnings have been used in expenditures for additional capital investments. In many cases yields less than the loan value of money have been returned to them. They are entitled to better dividends, particularly since increased disbursements would strengthen, not weaken, their present assets.

The general public also has an interest in the matter. All income is obtained from the public, and it is derived from the exploitation of a natural resource. Wasteful and extravagant methods of over-development are directly opposed to their best interests. A properly balanced program is their right. A normal, adequate profit is to be expected. This profit should be disbursed and flow freely in the channels of trade as do all other forms of national income.

The writers do not hold that a policy of building large reserves was ill-advised in the past. With the hazards and uncertainties connected with explorations for new sources of supply, with constant increases in annual demand, prudent management dictated the creation of heavy surplus accounts. With variable crude streams, with continual improvements in refining processes and with changes in plant equipment, large reserves for obsolescence and funds for new construction were required. Also, gradual contraction of the spot market for gasoline and other products caused many refiners to accumulate funds against the necessity of buying or building adequate distributing facilities for their own output.

Such necessities no longer obtain. With a long pull outlook for a continuous surplus of potential production, each new field brought in and each new well drilled offers definite assurance of a lower ratio of outlet to potential, for the new wells and for the old wells already curtailed. New refining processes and new plant construction are far less attractive when present facilities are not fully used. Above all, additional retail stations are clearly out of the question.

Moratorium on Expansion and Suspension of Construction

A moratorium on expansion and a suspension of new construction would permit dividend distributions more in line with true earnings under present conditions. It must be recognized that, had not most of the older and larger units early adopted a policy of drastic charge-offs to build up reserves, earnings under present conditions would offer in many cases a wholly inadequate return, a yield too meager when computed upon the actual value of the property account.

For many years niggardly dividends from strong companies were disregarded because the successful reinvestment of surplus after a period of years permitted security of principal in addition to an increased return. The present outlook raises grave doubts that such reinvestment of earnings will be equally advantageous. On the contrary there is direct evidence that it may be highly unprofitable. For these reasons the companies and their stockholders might be better served by larger dividend payments.

Another equally important point concerns the general attitude of the public toward oil shares. When the risks inherent in oil operations were uppermost in the minds of investors the management of the better grade companies sought to remove their securities from the speculative class of mining stocks by setting up reserves sufficient to remove from them the risks of sudden depletion. Such a policy was desirable and successful, as witness the current situation of many former units of the Standard Oil Company. Their importance in the present scheme of things has lessened greatly, but they find themselves in some cases with net quick assets in excess of their original capital investment.

A continuation of that policy may be challenged now. In selecting investments in common stocks the public now wants a fair rate of return or the certainty of increased values in lieu thereof. An overbuilt industry with a reduced earning power offers little promise of increased values. Heavy surplus accounts for reinvestment offer a definite certainty of diminished returns from expanded operations and threaten to assail future returns from present investments. What is true of the industry as a whole must be true of each company unless it relies upon its ability to beat the law of averages.

Each unit in the industry desires to grow, to expand its business. Obviously, all units cannot do so at a more rapid rate than the normal increase in consumption. And yet they do not desire to stagnate, to mark time or to contract. Their remedy lies in mergers to perfect their integration, geographical as well as departmental, and to improve efficiency.

Mergers Rather Than Duplicated Expansion

Such mergers will be advantageous only to the extent that the companies themselves complement each other. Beyond a certain point, size can be sought merely for the sake of bigness, not because it offers particular advantage. Where the separate departments of the companies concerned fit into a more coherent whole, such combines become efficient, economical, logical and of mutual advantage. Mergers, rather than duplicated expansion, offer great benefits to the progress of the unit companies, but such mergers further remove the necessity of heavy surplus accounts for plant expansion.

If the oil industry, its stockholders and the general public all would be benefited by reduced capital surpluses and reserves, there would seem to be every argument in favor of increasing the percent of earnings paid out as dividends. Such an altered policy can be made effective immediately by individual units, or eventually the Law of Diminishing Returns will be in control of the oil industry as a whole.

FINANCE

New York · May

SINCE our last writing the entire market has suffered a rather severe reaction, which seems to have been generally regarded as in the nature of a technical readjustment in a broad upward cycle rather than the preamble to a major bear movement. The present period of rather quiet trading and relatively small price changes is also a natural and usual consequence and may continue for some little time.

During this interval the oil stocks have given a relatively good account of themselves although most of them have lost substantial ground from their year's highs. Sentiment has been materially aided by the cooperation that is being maintained in the ranks of the industry and by the unexpectedly high rate of gasoline consumption, reported for the first quarter some 12 per cent ahead of last year. However, prices for both crude and refined products have been averaging somewhat below a year ago, and the effects of this are apparent in many of the first quarter reports that have come to hand. It should be remembered that gasoline stocks are still dangerously high, and it takes only a relatively small excess of this product to cut down profits.

CONSOLIDATED annual report of Standard Oil Company (New Jersey) reveals net income applicable to the parent company capital stock amounting to $120,912,794, equal to 10.2 per cent of the net assets shown on the consolidated balance sheet and to $4.75 per share on 25,418,968 shares (par $25) of capital stock outstanding at the close of the year. These profits represent a gain of about 11.5 per cent over the 1928 net of $108,485,686, which was equal to $4.43 per share on the slightly smaller number of shares outstanding at the close of that year. Dividend disbursements during the year totaled $46,519,704, an increase of about $10,000,000 over the previous year, leaving more than $74,000,000 to be added to profit and loss surplus.

Net fixed asset account increased by about $125,000,000 to about $732,300,000, and total assets mounted to $1,767,377,550. Current assets of $783,188,259 are to current liabilities of $170,109,461 in ratio of 4.6 to 1, while cash and marketable securities together total $241,996,490. Book value of the capital stock is $49.20 a share against $45.00 the previous year.

CONSOLIDATED 1929 net profit of $38,750,849 was reported by Standard Oil Company of New York (Socony) against $39,645,228 in 1928, equal to $2.23 and $2.28 per share respectively. Dividends disbursed during the year totaled about 70 per cent of net, leaving approximately $11,000,000 to be carried to surplus. Net fixed asset account increased about $17,600,000, while cash and its equivalent declined about $12,000,000.

SHELL UNION OIL, controlled jointly by Royal Dutch and Shell Trading & Transport, reported consolidated net income for 1929 of $17,573,249, equal after preferred dividends to $1.26 a common share. In 1928 the net amounted to $20,395,021, or $2.04 per share on 10,000,000 shares, there being no preferred then outstanding. During the year marketing activities were extended in the Mountain section and entry was made to the dense gasoline territory along the Atlantic seaboard. It is expected that Shell's distribution will eventually cover the entire country, thus paralleling the Texas organization which now markets in every state.

That this rapid expansion involves substantial outlays is witnessed by the increase in property account last year of almost $100,000,000 and the extensive new financing, including a 30 per cent common stock allotment and flotation of $40,000,000 of preferred and $50,000,000 of bonds. Company entered the present year in a very strong cash position and plans to continue its broad expansion program.

The policy has been to acquire wherever possible existing distributing facilities in order to avoid increasing the industry's burden through duplication. Thus high purchase prices are often necessary, and during the period of assimilation and coordination with the Shell organization it is difficult to secure an adequate return on the investment. This undoubtedly explains the disproportionate increase in expenses in 1929 which turned an increase in gross into a decline in net, and probably accounts in large measure for the poor

New York Stock Prices

1930 High	1930 Low	Current Div. $ per Annum	Stock (Par Value $)	Sales (Shares)	April 14—May 17 First	High	Low	Last	Change[1]
51⅜	36¼	†2.00	Atlantic Refining (25)	272,100	49⅞	49⅞	38	43¼	− 6½
34	20½	†2.25	Barnsdall, A. (25)	231,300	31⅞	31⅞	24	26⅝	− 5⅛
8¼	5⅛	....	Colon Oil (No)	7,400	6¾	7⅜	5½	5¾	− 1⅛
30½	19½	....	Continental Oil (No)	350,000	28⅝	30½	22½	27½	− 1⅛
7½	5⅜	....	Creole Petroleum (No)	33,900	6¾	6⅞	5¾	6¼	− ½
166⅞	131¼	1.50	Gulf Oil Corp. (25)	57,000	156½	166⅞	141¼	150½	− 5
119	78	2.00	Humble Oil & Ref. (25)	53,400	116¼	118½	94	105	−11
30	22½	0.50	Imperial Oil, Ltd. (No)	27,900	28⅝	28⅝	23	25½	− 3¼
28⅜	16	....	Indian Refining (10)	327,800	23¼	24	16	19½	− 4¼
24	17⅞	1.00	International Petr. (No)	54,300	23⅜	23¾	19¼	21	− 2¾
26½	21¼	....	Lago Oil & Transp. (No)	13,000	25	25⅛	23⅛	25½	+ ½
37	16¼	....	Mexican Seaboard (No)	567,800	33⅝	36½	22	28¼	− 5⅜
67½	50½	....	Pan Amer. P. & T., B (50)	120,200	57½	67½	55	65¼	+ 8¼
44¾	29⅛	**2.00	Phillips Petr. (No)	634,400	40⅛	44¾	37⅛	39¼	− ⅝
54	45	2.00	Prairie Oil & Gas (25)	19,200	51⅝	52¼	45⅜	47½	− 8¾
27¼	21½	1.50	Pure Oil (25)	107,200	25¾	26	22¼	23¾	− 2
28¼	20⅝	2.00	Richfield Oil (25)	110,300	26⅝	26⅞	20⅝	23½	− 3¼
56½	49¼	*3.20	Royal Dutch (N. Y.) (133⅓)	94,200	54⅜	56⅜	51¼	53⅜	− 1⅛
25½	20⅛	1.40	Shell Union (No)	117,300	24¼	25¼	20⅛	22	− 2¼
32	21⅝	2.00	Sinclair Consol. (No)	474,600	31	31½	24⅞	27⅝	− 3⅜
42	28⅞	2.00	Skelly Oil (25)	119,500	40⅛	41½	32	35	− 5⅜
75	55½	2.50	Standard Oil of Calif. (No)	322,300	71¼	75	66¾	70	− 1
59⅞	49⅞	2.50	Standard Oil (Ind.) (25)	187,200	58	58⅞	51⅛	54½	− 3⅝
40½	33¼	1.60	Standard Oil (Ky.) (10)	118,700	35⅞	40½	34	35½	− ⅜
84⅞	58	†2.00	Standard Oil (N. J.) (25)	3,267,600	78⅝	84⅞	71	79	.....
40⅜	31¼	1.60	Standard Oil of N. Y. (25)	860,600	37⅜	40⅜	34⅛	36⅝	− ⅝
70	53	§1.00	Sun Oil (No)	8,700	67½	68½	60⅞	65	− 2½
60½	50⅞	3.00	Texas Corp. (25)	250,500	58⅛	60½	55	57⅞	− ⅞
17¾	10¾	0.60	Tide Water Assoc. (No)	191,600	17	17½	14	16⅜	− 1⅛
24	16¼	‡0.30	Transcontinental, new (No)	695,100	19½	24	17¾	20¾	+ 1½
50	41½	‡2.00	Union Oil of Calif. (25)	32,800	47⅛	48⅞	43½	45¼	− 2
97⅞	85⅞	†4.25	Vacuum Oil (25)	88,800	93	97⅞	85⅞	89⅜	− 3½
4½	2¼	....	Venezuelan Petr. (5)	34,600	3½	3⅝	2⅞	3	− ½

[1]Since close of last month's table. †Including extras. §Plus 9% in stock. ‡Plus 4% in stock. *Paid last year—no regular rate. **Plus 5% in stock. ‡Initial dividend.

first quarter results just released. Net loss for the quarter of $3,155,008 compares with net profit for the first quarter of 1929 of $1,458,577, and is attributed in part to the lower prices prevailing as well as to the company's rapid expansion.

ATLANTIC REFINING reported a sharp decline in net in the first quarter of the current year. Profit of $1,124,300 after all charges compares with $3,892,600 in corresponding period of 1929, equal to 42 cents and $1.77 per share on the capitalization outstanding in the respective periods.

WITH ITS recent report for the first quarter of 1930, Phillips Petroleum has inaugurated the policy of presenting interim earnings statements after depreciation, depletion and similar bookkeeping adjustments which were formerly only calculated once a year. Net for the quarter on this basis amounted to 60 cents a share on 2,669,998 no par shares; but no comparable figures for the corresponding 1929 quarter are available. Net before these charges amounted to $4,328,645, nearly a 20 per cent gain over the 1929 first quarter net of $3,612,879.

The statement accompanying the release of these figures pointed out that prices for the company's products were considerably lower than in the 1929 quarter and that the gain was attributable to the wider scope of activity. Company is an important factor in the natural gas industry and is engaged in an expansion program designed to round out activities in all departments of the oil industry. Recent rights to stockholders to a 25 per cent stock allotment at $32 a share to holders of record May 15, to expire June 16, are in furtherance of this program.

A new subsidiary, Phillips Pipe Line Company, has been formed to build an 8-inch and 10-inch pipe line, 800 to 1000 miles long, to cost $12,000,000-$15,000,000. This line will transport company's products from Texas Panhandle and Kansas to points East, and already has enough business in sight to insure success of the project.

TRANSCONTINENTAL OIL is another of the few companies to report earnings gains in the first quarter compared with a year ago. Net, before all charges except Federal taxes, amounted to $1,173,869 against $527,551 in first quarter of 1929. On the new reduced capitalization of 3,230,000 no par shares these figures equal 36 cents and 16 cents per share respectively. The better showing being made is due to larger production from its Yates pool holdings. Without proration now in effect this would be further increased substantially. It is believed that a second dividend of 30 cents a share may be declared by directors at their meeting in June.

MEXICAN SEABOARD annual report showed consolidated net loss of $28,850 after all charges, compared with net loss for 1928 of $1,332,906, the latter figure excluding the net loss of $42,594 reported in 1928 by a subsidiary, Cia. Internacional de Petroleo y Oloeductus, S. A.

Production in Mexico declined moderately, and some development work was carried on in Venezuela. Output from the company's discovery well in Kettleman Hills field in California amounted to 1,217,855 barrels, and the chief hope and expectation for the company's future center in the large interest in this field. During the year, financing by rights enabled retirement of remaining funded debt of $3,500,000 and over $2,000,000 of notes. Financial position at close of year was strong.

DIRECTORS of Venezuelan Petroleum passed the 5-cent quarterly dividend which would have been due about May 15. It was stated that to an increasing extent cash resources would be used in development of concessions held in states of Zamora and Monagas, Venezuela. Company is controlled by Sinclair Consolidated Oil through ownership of slightly more than half of capital stock. Earnings in 1929 were 19 cents a share against 8 cents a share in 1928.

SINCLAIR CONSOLIDATED OIL stockholders have approved increase in authorized no par common from 10,000,000 shares to 20,000,000. This places directors in better position to expand the business upon favorable opportunity by acquisition of properties or in consummating mergers. Company reported 1929 net equal to $2.82 a share of common, compared with $2.21 earned in 1928. Announcement of completion of negotiations for acquisition of Pierce Petroleum assets in U. S. and Mexico has just been made. Under the plan payment will be made in Sinclair common on a basis approximating slightly more than one share of Sinclair for each four of Pierce Petroleum. Pierce preferred will be paid off and the debentures and current liabilities will be assumed by Sinclair.

SKELLY OIL COMPANY has sold $12,000,000 of 6 per cent cumulative preferred with warrants. Proceeds are to be used for further expansion and development and for other corporate purposes. Each certificate carries a non-detachable warrant entitling the holder to purchase two shares of common for each share of preferred at $42.50 during the first year, $46 during the second year and $50 during the third year from the date of issuance.

C. C. BAILEY.

London · May

INFLUENCES operating on the London market for oil shares have been conflicting in character, but their net effect has been to produce a lower general level of prices after a moderate rise. The latter was due principally to the advances announced from America in oil prices, reductions in petrol stocks, and the views continually expressed by leaders of the industry that events are gradually shaping towards equilibrium between supply and demand, partly through more effective conservation plans. Another bullish factor was the report that the price war in the Far East between the Royal Dutch-Shell Group and Standard Oil of New York was ending. No official confirmation has been given to this rumour, which is nevertheless believed correct, prices for kerosene and petrol in the Dutch East Indies having been advanced to a level equal to United States quotations plus transport costs.

GENERAL stock market depression and the sharp set-back in prices in New York were the principal influences making for lower quotations. But the technical position of oil shares in London is still satisfactory. There is little evidence of a speculative account of any size, and the leading counters are in rather short supply. Prices responded to the resuscitation of public interest awakened by the maintenance of the Shell dividend for 1929 at 25 per cent net and of the Royal Dutch dividend for the same period of 24 per cent, payments being made on the increased capital in each case.

LOBITOS OILFIELDS £1 shares have been the center of a good deal of activity, buyers having been attracted by the suggestion that the forthcoming dividend is to be increased. This undertaking has probably suffered as much as any established British producer from world overproduction and low prices. Its dividend has come down from 75 per cent free of income tax to 10 per cent less tax since 1922. An exceptionally high quality of light oil is produced at the properties in Peru, but no effort is being made to increase production. The oil is being left in the ground pending a better selling market, and attention of the management has been concentrated on reducing expenditure. Econ-

omies, and possibly high earnings by the company's fleet of tankers, are the factors most likely to have produced a better result for 1929 than for 1928. Anglo-Ecuadorian, the subsidiary company, has also contributed by paying its first dividend, of 3½ per cent, for the year ended June 30, 1929. Both Lobitos and Anglo-Ecuadorian shares achieved a good advance, but in neither case has the rise been held.

London Stock Exchange Prices

1930 High	1930 Low	1929 Div. % per Ann.	Share	April 15 - May 15 First	High	Low	Last	Change
1 1/16	3/8	3 1/2	Anglo-Ecuadorian	2 1/16	1 1/16	2 1/16	15/16	+3/16
2 3/8	2 1/4	22 1/2	Anglo-Egyptian B	2 5/16	2 3/8	2 15/16	2 15/16	— 1/16
4 15/16	3 5/8	12 1/2	Anglo-Persian	4 5/8	4 3/8	4 1/2	4 7/16	— 3/16
1 13/16	1 1/8	52 1/2	Apex Trinidad (5s.)	1 7/16	1 5/16	1 3/8	1 3/8	— 1/16
2	1	7 1/2	Attock	1 11/16	1 11/16	1 5/8	1 5/8	— 3/16
3/8	15/16	12 1/2	Brit. Borneo (10s.)	11/16	3/8	11/16	9/16	+ 1/16
11/16	9/16	7 3/4*	Brit. Burmah (8s.)	9/16	9/16	9/16	9/16	.....
1/4	5/16	....	Brit. Controlled ($5)	7/16	1/4	3/8	7/16	.....
3/8	1/4	....	Brit. Controlled Prefd. ($5)	11/16	3/8	1/2	11/16	+ 3/16
4 7/16	3 19/16	20	Burmah	4 5/8	4 3/8	4 7/16	4 11/16	+ 1/16
11/16	17/16	....	Canadian Eagle (no par)	11/16	11/16	3/8	3/8	— 1/16
1 1/2	1 5/16	....	Creole Petroleum (no par)	1 11/16	1 3/8	1 7/16	1 9/16	— 1/16
1/16	1/4	....	Kern River (10s.)	5/16	5/16	1/4	1/4	— 1/16
2 21/16	1 23/16	10	Lobitos	2 11/16	2 21/16	2 3/16	2 13/16	+ 1/16
3/4	5/16	....	Mexican Eagle ($4 Mex.)	25/16	3/4	21/16	21/16	— 1/16
68 1/2	51	....	Pan American B ($50)	58 1/2	68 1/2	57 1/4	68	+9 1/2
1 1/16	7/16	2 1/2	Phoenix	19/16	5/8	19/16	19/16	.....
35 1/4	30 15/16	24	Royal Dutch (100 fl.)	33 7/8	34 3/4	32 3/4	33 5/8	— 1/4
4 31/16	4 3/8	25*	Shell Transport	4 37/16	4 39/16	4 5/8	4 37/16	.....
1/2	13/16	4	Steaua Romana	7/16	1/2	7/16	7/16	.....
3 7/8	3 1/16	30	Trinidad Leasehold	3 19/16	3 5/8	3 1/16	3 1/16	— 13/16
3/8	9/16	....	Utd. Brit. of Trinidad (6s. 8d.)	11/16	3/8	11/16	11/16	.....
3 1/16	2 19/16	22 1/2	Venezuelan Oil Concessions	2 23/16	2 15/16	2 23/16	2 29/16	+ 3/16

*Denotes tax free dividend. †Denotes "ex rights" price.
Nominal value of shares £1 unless otherwise indicated by bracketed figures.

MAINTENANCE of the dividend on Anglo-Egyptian B shares at 22½ per cent for 1929 created a favorable impression. Although the rate was the same as for 1928, the payment for that year represented an advance of 5 per cent on the preceding twelve months and of 10 per cent of 1926. Its repetition now is taken as evidence that the rise in profits in recent years is something more than a temporary movement—a point on which dealers had been a little doubtful owing to the negative results obtained from prospecting some areas which the company controls. Production for 1929 was less than in 1928, when expenditure was increased by refinery additions. The company has probably reaped the benefit of these improvements and from the cracking plant erected last year. Capital consists of £1,808,000 in £1 shares, of which 1,708,000 are the B shares known to the investing public. The Egyptian Government holds the remaining 100,000 C shares and will draw the equivalent of nearly 39 per cent in dividends for 1929 under the arrangement for division of profits between the two classes of capital. The company is controlled by the Royal Dutch-Shell group through the Anglo-Saxon Petroleum Company.

SHAREHOLDERS of British Controlled Oilfields have decided that the voting trust which controls the undertaking is to remain in existence for the present. The trust was formed in 1918, when the company was incorporated in Canada, to preserve effective direction in British hands. Actual shareholders hold only voting trust certificates, in which the market deals. Alleged mismanagement of the company's affairs a few years ago led to questions as to the validity of the voting trust, and litigation was commenced to test the matter. The meeting held early this May was called as a result of the proceedings. Out of 4,512,830 common shares outstanding, holders of only 54,735 voted for the dissolution of the trust. Owing to the fact that a readjustment of capital is pending, the interests responsible for the litigation against the voting trust had ceased to press the matter. This accounts largely for the small number of votes cast. The company announces that a new well has been brought in on the western extension of the El Mene field with an initial unrestricted production of 4000 to 5000 barrels a day. In view of the new location, the management attaches considerable importance to this development, and the shares took an upward turn.

CUT OF 5 PER CENT in the Trinidad Leaseholds interim dividend was a disappointment to the market. In view of unsatisfactory selling prices, dealers had expected a smaller return to shareholders, but a 10 per cent interim had been looked for. For the year to June 30, 1929 the final was 17½ per cent, making a total of 30 per cent. The directors now state that notwithstanding the larger quantity of oil handled, lower prices have resulted in an appreciable decrease in profits. The company has an excellent dividend record, and thanks to a conservative policy pursued over many years, enjoys a sound financial position. It has a first-rate property and an extensive refinery business. Any set-back in profits is not considered likely to be more than a temporary development, but the market sees nothing more to go for at the moment and has marked down the price of the shares accordingly. The company's interests were recently extended by the acquisition of a large interest in the Siparia Trinidad Oilfields, to exploit rights taken over from Venezuelan Consolidated Oilfields. This may entail a draft on financial resources, but nothing sufficient to impair the cash position in any way.

A. H. DAY.

Paris Bourse Prices

1929 Div.	1929 Par	Share	April 1-April 30 First	High	Low	Last	Change
50 lei	500 lei	Astra Romana	255	295	244	263	+ 8
.....	500 lei	Colombia	172	189	172	180	+ 8
50 lei	500 lei	Concordia	143	169	143	150	+ 7
.....	500 frs.	Crédit Gal. Des Pét. act	972	995	924	938	— 34
.....	.....	Crédit Gal. Des Pét. parts	10500	11300	10500	10700	+200
.....	500 frs.	Franco Pol. Des Pét. act	168	185	168	180	+ 12
.....	.....	Franco Pol. Des Pét. parts	654	705	654	630	— 24
$1	$10	Franco Wyoming	570	610	570	582	+ 12
30 frs.	500 frs.	S. G. Huiles Pétroles act	538	580	538	580	+ 42
.....	.....	S. G. Huiles Pétroles parts	259	284	259	268	+ 9
.....	500 frs.	Cie. Fse. des Pétroles	1080	1092	1015	1190	+110
50 frs.	500 frs.	Cie. Indus. des Pétroles	1015	1025	1010	1010	— 5
.....	500 frs.	Lille Bonnières priorité	1169	1214	1169	1190	+ 21
.....	500 frs.	Lille Bonnières ordinaire	799	825	780	780	— 19
.....	500 frs.	Malopolska act	338	360	318	336	— 2
.....	.....	Malopolska parts	2650	3200	2625	2885	+235
.....	.....	Mexican Eagle	169	179	167	731	+ 4
17.50 frs.	250 frs.	Omnium Inter. Pétroles	228	260	222	239	+ 11
50 frs.	500 frs.	Péchelbronn	1060	1080	1040	1060	.....
60 frs. Bel.	500 frs. Bel.	Pétrofina	681	742	681	710	+ 29
240 fl.	1000 fl.	Royal Dutch	41500	43405	41500	42500	+1000
25 fl.	100 fl.	Royal Dutch 1/10	4170	4350	4170	4245	+ 75
5 sh.	£1	Shell	600	617	600	608	+ 8
25 frs.	500 frs.	Steaua Française	334	350	320	320	— 14

Standard Oil Tankship Protection

Free Use Offered of System to Prevent Explosions in Oil Holds or on Deck, by Means of Inert Cooled Gas from Boiler Flues, Should Lead to Wide Adoption of this Safety Measure

STANDARD OIL COMPANY of California announces the dedication to public use of one of its most important developments in the fire protection field, namely a system by which explosions on tankships are made virtually impossible.

Such explosions, occurring in some instances with serious loss of both life and property, have generally been regarded as one of the hazards of tankship operation. Generally speaking, they are the result of accidental ignition of the highly explosive mixture of oil vapors and air formed when a volatile oil such as crude or gasoline is pumped out of a tankship and air flows into the tanks to take the place of the liquid.

While Standard Oil of California's fleet has been fortunate enough never to have suffered such an explosion, the company has realized the danger under which tankers inherently operate. Several years ago company engineers started investigating methods by which this hazard could be eliminated. Realizing that an explosion cannot occur unless the oxygen of the air is present to combine with the petroleum vapors, the simplest and most direct way of eliminating the hazard appeared to be some means of filling the tanks with a gas containing little or no oxygen and not supporting combustion.

Fortunately, no special apparatus for the manufacture of such a gas is necessary on a steamship. Tremendous quantities of flue gas, from which the oxygen has been consumed by the boiler fires, are constantly passing up the stack. This waste product, when properly cooled and washed, makes an ideal inert gas for introduction into the vapor space of the cargo tanks. The sketch hereunder shows diagrammatically the way this plan has been put into effect on several Standard Oil of California ships.

This plan of putting gases from the boiler flues into a ship's tank might appear to be anything but a safeguard for the ship. Yet actually no hot gas can possibly find its way into the cargo tanks. If the layout be examined one will see that, as the gases are withdrawn from the stack, they flow through a washer in which a deluge of cold salt water brings the temperature of the gas down to practically that of the sea and washes out any soot that it may carry. As a still further safeguard, an automatic valve on the cooler outlet is held open against the pressure of heavy springs by a steam piston supplied with steam from the steam jet pumps used to pull the flue gas from the stack, so that should the steam supply fail, the valve closes instantly. A connection is also made in such a manner that even partial interruption of the cooling water supply will release the steam pressure and permit the valve to close.

A flue gas system of the type described safeguards a tanker in three chief ways.

1. By preventing oxygen from getting into the tanks when they are emptied, it insures that, during the period of unloading and the return voyage empty, the tanker's compartments are so thoroughly protected that they could not be ignited even if someone deliberately plunged a flame into them.

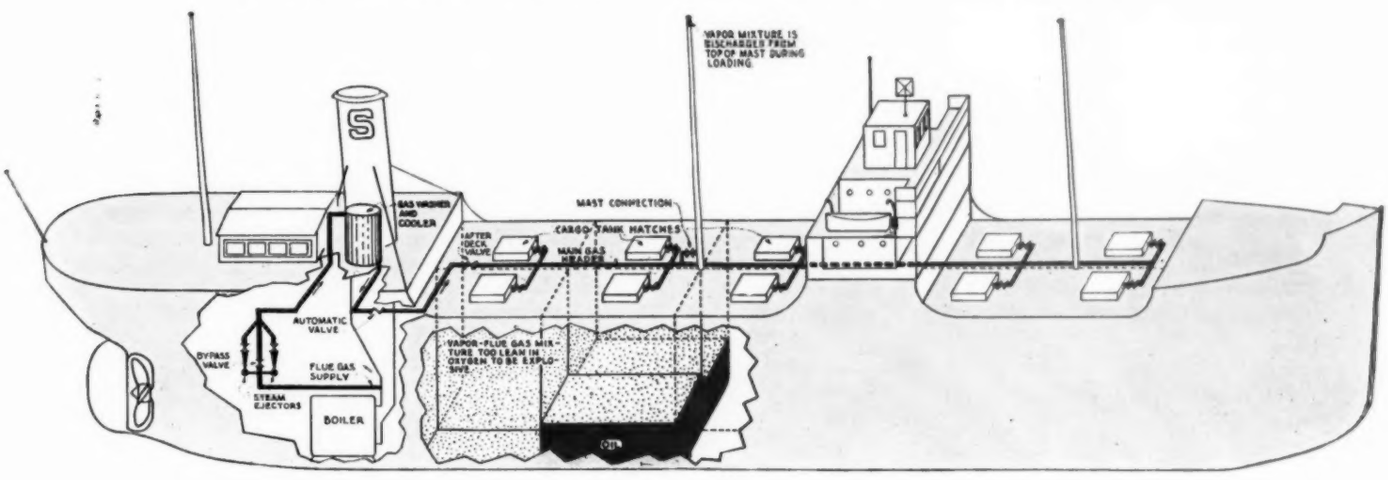
2. During the period of loading, the vapors, instead of being pushed out through the ullage holes to the deck—as is the case in an ordinary tanker—can all be collected through the flue gas piping system and discharged through the connection shown in the sketch, up and out the top of a hollow mast. This eliminates one of the most hazardous conditions of ordinary operation. For when a tanker not equipped with such a system is loading, a constant flow of highly combustible vapor is discharged to the deck of the ship—where workmen must walk to and fro regulating valves, getting back and forth from quarters, etc.

3. When the tanks have to be cleaned, flue gas can be blown into the bottom of the tank through the cargo lines, discharging the mixture of residual petroleum vapors and flue gas. By this process practically all of the petroleum vapor can be quickly swept out of the tanks. Then when the tanks are opened up to be swept out with fresh air by wind sails, there is no chance of passing through an explosive range as when fresh air flows into tanks containing straight petroleum vapors. Some of the worst tanker accidents have occurred during cleaning operations. The gas equipped ships are effectively safeguarded against such accidents.

The first Standard Oil of California tanker to be equipped with this protective system was the H. M. Storey on which the system was put into commission in May, 1927. Six other tankers have since been similarly equipped. Despite the mechanical difficulties inherent in any such new development, the systems on all these ships have functioned as planned better than 90 per cent of the time they have

Continued on next page

Diagram of the washed flue-gas system of tankship protection developed by Standard Oil Co. of California



SHIPPING

London · May

IN SCANDINAVIA the increase in tanker tonnage is a particularly noteworthy feature of shipping, and according to a recent report published in the Norwegian Journal of Commerce the accounts of tankship owners for 1929 have shown a very gratifying surplus. The same account states however that rejoicing is premature, because insufficient attention has been paid to the fact that these ships may in a few years be of little or no value.

This assertion is based on the suggestion that large sums of money have to be spent in the repair of tankers. One case is cited where after only 12 years' operation a large tanker had to have spent on her some $500,000, a sum corresponding to about three-fifths of the original cost of the ship.

Another case is cited of a Norwegian owner who bought an 11 years' old motor tanker in which the main machinery turned out to be very much the worse for wear. In spite of the fact that this ship was bought against a survey, new motors had to be installed one year after the purchase.

Arguing along these lines, it is suggested that the actual profit will in reality be a deficit because of the cost of repairs after survey at the end of a few years' service. British shipowners are credited with being particularly farsighted in their tanker policies in that they sell their ships at eight to twelve years' age and build new ones. This is certainly borne out in recent practice, as shown by the fact that big tankship companies which have recently placed contracts are now selling their older tonnage.

Rumours are circulating in London as to the possible placing of contracts very shortly for some more tankers of coastwise type, but to date nothing has materialized. It would appear, however, that the increasing demand everywhere for petrol is causing owners to see that water distribution is not only the most efficient, but also the cheapest mode of transport.

Charters

Among tanker charters fixed last month attention may be drawn to Bisca, a 7500-ton motor vessel which has been chartered for California to Australia 47/- clean. Another motor vessel, Katendrecht of 6000 tons, has been chartered from Black Sea to Baltic on a 31/6d. basis, while Sjomand of about 3500 tons is now engaged on a charter for one or two consecutive voyages, Northern States to Lisbon 26/9d. net clean.

Sales

An old French tanker, Madeleine, built in Holland in 1907, has been sold by Les Armateurs Français to Léon Poiret of Paris, while Black Sea built as far back as 1896, of nearly 4000 tons dw. and owned by Davis & Newman, is said to have been transferred to the Société Franco-Egyptienne of Paris. This ship, it will be remembered, some few years ago blew up in New York harbour and was practically destroyed. Splendid repair work was done on her in New York, however, and she has been in almost continuous service ever since.

Delivered

Among recent completions is the twin screw steamer Maipo which the Armstrong yard at Walker-on-Tyne has built for the Chilian Navy. No capacity figures are available on this vessel, presumably because she is a naval ship, but her dimensions have been stated as 378 ft. overall and 49 ft. 9 in. moulded breadth. She is propelled by triple expansion steam engines.

Launchings

One of the most important launches to be chronicled recently is that of the Westfal Larsen tanker Storanger. This ship is a 13,000-ton deadweight vessel and will have twin diesel engines of Kincaid B. & W. type.

Swan Hunter recently launched Filefjeld and Havbor, each of about 11,000 tons bulk oil carrying capacity, with diesel engines. These are more or less standard tankers for Oslo owners. The Götaverken plant in Sweden is now fitting out the tanker Chr. Th. Boe, a 9000-ton ship, 467 ft. length with about 1500 hp. The United Molasses Company has had launched for it at the Lithgow Yard (Port Glasgow) the 13,000-ton ship Atheltemplar. (The four ships mentioned were all launched within the short space of four days). The chairman of the United Molasses Co. in his recent report spoke very glowingly of the big fleet of motor tankers that this company has. Its motor ships are depreciated at the rate of 6 per cent and its steamers at the rate of 10 per cent per annum of the original cost.

Furness Shipbuilding Co. has over the past year or so set up various records for size of vessels launched on the Tees, having several tankers of 15,000-17,000 tons deadweight. Such records have now been eclipsed by the launch of the twin-screw motor whaling factory, Sir James Clark Ross, of 20,000 tons deadweight, recently launched. This vessel, especially designed for the Rosshavet Company of Sandefjord, Norway, is one of the largest vessels ever constructed for the carriage of oil. She is of shelter deck type with machinery aft, and has been constructed on the Isherwood patent bracketless system of framing. She is actually a conventional tanker, with the lofty shelter tween deck arranged to accommodate the whale factory equipment. Her cargo pumps, comprising three horizontal direct action units, are each capable of dealing with 250 tons of oil per hour.

A. C. HARDY.

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Standard Oil Tankship Protection

Continued from previous page

been in service. On the basis of this experience it is expected that future installations should give very close to 100 per cent performance.

No plans have been made for utilizing the exhaust gas of diesel engines in a flue gas protection system for a ship, because the exhaust gas of diesel engines is quite high in oxygen and thus in general would not furnish reliable protection.

In order that any person or firm operating tankships may have the benefit of this very effective form of protection, the Standard Oil Company of California is prepared to furnish, without charge, to anyone engaged in the construction or operation of oil tankers, general drawings illustrating the design and installation of the different parts of such a system. A full set of approximately 50 detailed working and pattern drawings will be furnished for a cost charge of $50. European requests may be addressed to the London office of World Petroleum, 110 Fenchurch St., E. C.

Standard Oil Company of New Jersey

Sage Comment on Weightiest Problems Confronting Oil Industry Is Interspersed With Account of Company Operations in Annual Report of Largest Unit in World Oil Business

EVERY important phase of the oil business is separately considered and reviewed in the report of W. C. Teagle, president of the Standard Oil Co. (N.J.), on the operations of this company in 1929. The pronouncements on different phases of the business are a valuable contribution to current thought. In a trenchant manner they cut at the roots of problems and expose them clearly. The conclusions are vigorously and straightforwardly expressed. When they come to be more generally heeded the oil business will reach a sounder condition.

Hereunder the report is presented almost complete, the only sections omitted being those relating to the national gas subsidiaries, Standard Oil Development Co., Stanavo Specification Board, Inc., and hydrogenation—which was more fully covered in the April issue of World Petroleum. Financial details are given on page 174 (ante). The report reads:

Petroleum Industry in 1929

In the light of such progress as had been made in restoring its economics to a basis of adequate earnings and conservation of resources, it is of interest to review the varying fortunes of the petroleum industry over the past three years. In 1927, for the first time, the world's petroleum reserves were demonstrated to be comparable to the raw material reserves of other basic industries in that uncertainties as to early exhaustion were definitely dispelled. In 1927, also for the first time, the petroleum industry had the advantage of leadership and cooperation represented by the Federal Oil Conservation Board and by the officials of several States in their efforts to effect conservation and to regulate to some extent the production of crude to conform with world requirements. After the enormous increase in crude stocks in the earlier months of that year, voluntary cooperation was resorted to and a large amount of potential production was held in the ground.

The corrective influences of this movement were so immediate and so marked that it was more generally adopted during 1928. In that year the industry reduced the amount of crude and finished products forced into storage from 69,000,000 barrels in 1927 to 23,000,000 barrels. It conducted its manufacturing operations more intelligently during the winter months by avoiding an undue accumulation of products and, largely as a result of the conservation measures begun in 1927, it added materially to its earnings.

The beneficial effects were in fact so apparent as to instil a spirit of optimism throughout the industry, and this first found expression early last year in the refinery pyramiding of runs of gasoline in quantities that exceeded the existing and deferred requirements. This policy not only built up stocks of gasoline, but drew upon crude production, with the result that in the early summer crude prices were advanced, the inevitable bringing in of excessive new production followed and for the time being the cooperative program was jettisoned.

The cycle which began in 1927 was complete and the industry was back at the starting point. A realization of the fallacy of such a relapse led to remedial measures in the Mid-Continent field, which measures were particularly effective in Oklahoma. The momentum of this curtailment was barely under way when crude production in California increased prodigiously, and it was close to the end of the year before the correction of this situation had begun. On the whole, the position at the close of the year was reflected clearly by the volume of stocks above ground. These amounted to approximately 688,000,000 barrels of crude, semi-refined and refined products, of which 67,000,000 barrels were accumulated during the year.

Dislocated Economics

That overproduction of crude was not the sole cause of this uneconomic condition is indicated by the fact that of the accumulation 36,000,000 barrels were crude oil, 10,000,000 barrels gasoline, and 14,600,000 barrels gas and fuel oil. Throughout most of the year the wholesale price of gasoline was below the average due to the excessive refinery runs, the full momentum of which was felt in the fourth quarter. That this lower price range existed during a year in which crude prices were advanced indicated the dislocation of the industry's economics.

Increase in the surplus gasoline stocks by 10,000,000 barrels demonstrated the inelastic character of the consuming markets and forecast an ultimate readjustment of crude prices to conform with the price range of gasoline. The theory that the price of gasoline may be artificially held to maintain a fixed value for the crude has been proven to be economically unsound, since the price the consumer pays for the product depends entirely on the margin between supply and dominant demand and must inevitably influence the value of the raw material.

Earnings of the industry in 1929 were generally improved, but the statement that they reflected conditions throughout the year would be hardly warranted. The events of 1928 were the determining factors in the earnings of the past year, and, while from a financial standpoint the situation was improved, the physical position was impaired by the further accumulation of stocks of crude and gasoline.

Production of crude in the United States was 1,001,702,000 barrels as against 888,676,000 barrels in 1928. Imports of crude were 78,914,000 barrels, a decrease of 853,000 barrels from the previous year.

Company Production

Gross crude production of subsidiary and affiliated interests of the Standard Oil Co. (N. J.), was 101,100,098 barrels, an increase of 14,960,136 barrels, or 17.37 per cent, over the production for 1928. Domestic fields supplied 51,657,552 barrels and foreign fields 49,442,546 barrels. The total production was 51.6 per cent of the crude run.

The bulk of the domestic production was obtained by Humble Oil and Refining Company in Texas, The Carter Oil Company—principally in Oklahoma—and the Standard Oil Company of Louisiana—principally in Louisiana. Various subsidiary and affiliated gas companies contributed to the total with crude produced in conjunction with gas operations. Although the domestic production showed

an increase of 8,883,881 barrels, most of which resulted from the operations of the Humble Company in the southwest Texas fields, a much larger gain would have occurred had production activities been extended to the capacity of the fields. Production by the Carter Oil Company was approximately 1,000,000 barrels less than for the preceding year, a decrease primarily due to proration and conservation measures in the Oklahoma fields.

Production by foreign subsidiaries in Canada, Mexico, South America, Dutch East Indies and Europe was larger by 6,076,256 barrels than that for the preceding year.

The increase in total production, amounting to 14,960,136 barrels, was conveniently absorbed into the company's operations, as evidenced by the amount of crude on hand at the end of 1929, this showing an increase of only 4,704 barrels. At the close of the year all affiliated interests were currently producing about 285,000 barrels daily. This was materially lower than their potential capacity, owing to voluntary curtailment put into effect in some localities in the interests of conservation.

Natural Gasoline

Production of gasoline from casinghead and natural gas was approximately 10 per cent in excess of that of the previous year, or 4,225,000 barrels, as compared with 3,817,000 barrels in 1928. A number of new plants were installed to keep pace with the opening of new crude fields or the extension of older pools. The change in motor fuel quality, through a closer control of volatility with reference to stability of the product, necessitated altering some of the natural gasoline recovery plants to permit of eliminating the more volatile or unstable fractions.

Pipe Lines

Trunk pipe lines of subsidiary and affiliated companies represented 3,737 miles at the end of the year. These lines delivered a total of 133,392,079 barrels of crude oil, an increase of 12,500,000 barrels over 1928. The most important extensions made to new producing areas were a line 126 miles long to the Salt Flat Field in Texas and a line 50 miles long to the Oklahoma City Pool in Oklahoma.

The character of the business of the Tuscarora Oil Company, Limited, changed from that of a crude carrier to that of a gasoline carrier, and the pumping system was reversed from an eastward to a westward movement. The pipe line is approximately 370 miles long, running from Bayway, N. J., across the state of New Jersey to the western boundary of Pennsylvania.

Marine

Overproduction of crude and manufactured products played an important part in the transition from a surplus to a shortage in world tanker tonnage. In addition to expansion in domestic consumption and in exports there were heavier requirements for movement of clean products to the eastern seaboard of the U. S. as well as a larger volume of movement for greater distances. The resultant tonnage shortage brought all world tankers available for commercial service into operation by the middle of the year. As a consequence, market freight rates remained practically fixed at the high levels reached at that time. Earnings were substantially greater under the new rates, which average 60 per cent higher than those prevailing during the previous year.

At the close of the year the world tanker tonnage afloat aggregated 10,650,000 deadweight tons. An additional 15 per cent, or 1,670,000 tons, under contract for construction, is almost four times that building at the close of 1928. It is reasonable to expect that the present high level of rates will continue until curtailment of production or manufacture reduces requirements or until delivery of tonnage now building creates a surplus.

The 118 tankers owned by subsidiaries and aggregating in excess of 1,250,000 deadweight tons constitute an increase of 17 in number and more than 200,000 deadweight tons as compared with the close of 1928. Completion of tankers now under construction, consisting of two 19,000-ton high pressure steam driven vessels, six 16,000-ton diesel vessels and smaller ships being built for special trades, will give to the Standard Oil Company (N. J.) ownership of more than one-tenth of the world tanker tonnage afloat.

An increase of 13 per cent is indicated by the total bulk oil movement of 164,394,084 barrels transported in tonnage owned and chartered. Of this, 111,422,694 barrels were transported in the average of 71 vessels owned and chartered by the Standard Shipping Company.

Absence of serious accidents during the year kept losses substantially under the premiums set up against the marine insurance reserve on the basis of outside market rates.

Manufacturing

Total crude run by all refineries was 196,797,000 barrels, an increase of about 15,000,000 barrels over 1928. Average daily through-put of crude at the domestic plants was 409,098 barrels as compared with 394,924 barrels in 1928. The statistics of this year include for the first time the operation of the Beacon Oil Company's refinery at Everett, Mass. In the refineries operated in Canada, Cuba, Argentina, Chile, Roumania, Dutch East Indies, Norway, Poland, Italy, Peru, Venezuela, Trinidad and England 130,072 barrels were run daily as against 102,162 barrels in the preceding year.

It is obviously essential that the refiner manufacture his products at lowest cost as well as in the proportions and of the quality required by the trade. This demands constant ability to meet the changing requirements for products—especially motor fuels and lubricants—brought about by engineering advances in other industries, as well as to overcome the difficulties of operating on a frequently changing quality of raw material. Through continued research and development, resulting in equipment of improved engineering design, we were able during the past year not only to improve the efficiency but also to keep pace with this essential need of flexibility in refinery operations.

A very substantial improvement was affected in the anti-knock quality of the gasolines produced in response to the increasing demand for motor fuels suitable for internal combustion engines of higher compression ratio.

Further attention was given to the comprehensive planning and coordination of activities which resulted in a greater degree of uniformity in refinery operations and consequently a minimum disturbance to personnel. It also permitted the continuance of the policy of holding inventories at a minimum with a resultant economy in overhead charges. No increase in stocks was made by the refineries, notwithstanding the larger business handled and the fact that inventories were at the minimum at the beginning of the year due to the large reductions accomplished in previous years.

Marketing

During 1929 the overproduction of crude and manufactured products throughout the industry glutted the markets, bringing about price cuts and other uneconomic conditions. In spite of this the domestic companies generally retained their customers and secured a fair share of the increase in consumption.

The practice of some competitors, when entering a new field, of encouraging tank car buyers with particularly favored prices, so they may in turn grant price concessions, is detrimental and disturbing to sound marketing. It secures a temporary benefit for the company encouraging the tank car buyer, but at the sacrifice of sound marketing conditions, and it provides a permanent sales evil. The gross profit thus assured the tank car buyers is out of proportion to that of the refiner. It is at least as much, and often more,

than the refiner gets for his gasoline at seaboard shipping points and yet bears no comparison to the investment of the refinery nor to the hazards involved in producing and transporting crude, manufacturing finished products and transporting them to seaboard distributing points.

The Code of Marketing Ethics approved by the Federal Trade Commission and put into operation September 1, 1929, has tended to eliminate many unsound marketing practices, and its wider adoption by all engaged in marketing petroleum products is in the public interest.

Conditions in the foreign markets were similar to those in 1928. The company's business expanded at a satisfactory rate and in keeping with the increase in consumption in these markets. The sale of anti-knock motor fuel, Esso, was inaugurated in foreign countries, and indications are that there will be a considerable demand for it. The sale of motor oil directly to consumers has likewise made progress.

Standard Oil Export Corporation

Organized under the laws of Delaware on November 26, 1928, the Standard Oil Export Corporation was qualified as an exporting entity on January 1, 1929. All of the stock is owned by four subsidiaries of the Standard Oil Company (N.J.), and it controls and directs the export business of these subsidiaries. The Standard Oil Export Corporation recently acquired, through an exchange of its non-voting 5% cumulative preferred shares, about 94 per cent of the stock of the Anglo-American Oil Company which in the past has been a large purchaser of the petroleum commodities now handled through the Export Corporation. Steps are now being taken under the English Companies Act to acquire the remaining 6 per cent. An issue of $75,000,000 of 5% preferred stock of the Standard Oil Export Corporation was listed on the New York and London Stock Exchanges in February of this year. The exchange of stock through which the Anglo-American Oil Company, Ltd., was acquired was effected on a basis of 5-5/9 shares of that stock for one share of Export Corporation. Prior to the transaction, Anglo-American Oil Company, Ltd., was engaged solely in marketing petroleum products. Its acquisition will have the effect of assuring the Export Corporation an outlet for its export cargoes in the British Isles and at the same time will guarantee the Anglo-American Oil Company, Ltd., a source of supply.

Foreign Conditions

Europe is still experiencing a period of gradual reconstruction, and in 1929 some further progress was made in its economic readjustment. The monetary stabilization became further consolidated and, with the exception of the Spanish peseta, no market fluctuations occurred in the various currencies. The financial improvement has been an important factor in enabling trade to develop progressively, not only from an internal agricultural and manufacturing standpoint, but also in the way of assistance to European exports.

This improvement in economic conditions has had a direct bearing upon the development of the petroleum business, which, however, continued to partake of a highly competitive character and in some countries was handicapped in its normal development through political interference and government restrictions.

The expansion and growth of the gasoline business in Europe would be much more rapid were it not for the heavy import duty and direct taxation levied on petroleum products, gasoline in some countries being subjected to a fiscal burden varying anywhere from 9 cents to over 16 cents per gallon. With such taxes, gasoline is still more or less a luxury and enters into popular use on no such scale as exists in the United States.

Reports from Russia do not seem to indicate any prospects of improvement in the generally disorganized conditions prevailing throughout the country.

Stock Ownership

The trend toward the diffusion of ownership of the Standard Oil Company (N. J.), among an increasing number of investors has been particularly marked during the past year. The popular concept of a business operated for the gain of a small group has changed, since its affairs are now a matter of concern to over 104,000 individuals who jointly share in the proprietorship of its assets. The company is not a closed corporation, the profits of which accrue to a few, but a publicly owned enterprise, the interests of which are identical with the interests of a large section of the community. The individual holdings of 81 per cent of the stockholders are less than one hundred shares. Of the total number of stockholders almost 36,000 are women.

Through the stock acquisition plan the trustees have distributed 1,309,116 shares of common stock to employees. The third plan has been in operation one year and on December 31, 1929, had approximately 23,500 subscribers for whose accounts the trustees held 120,000 shares. Over 63 per cent of the shares already distributed were still retained by employees on February 15, 1930. This partnership has been of great value in developing a spirit of loyalty and cooperation throughout the organization.

Conclusion

After three years of effort to relieve itself of the incubus of overproduction the industry found itself at the close of 1929 with record stocks in storage. Operators in a number of producing areas have adopted a wise course in their voluntary curtailment of output, and a situation that might have had disastrous consequences was kept measurably in hand. The industry has not made progress to the extent of bringing about an actual reduction of stocks, but in its spasmodic attempts to attain that goal it has at least prevented more excessive overproduction than actually occurred.

An event of this year which marked a new phase and which afforded a basis for optimism was the report of the Committee on Petroleum Economics (of which J. Elmer Thomas was chairman—EDITOR), issued under the authority of the Federal Oil Conservation Board. For the first time a program that may lead to a solution of the overproduction problem has been crystallized in definite form by a government appointed body. On account of the painstaking care evidenced in its preparation and the logic of its deductions, the report deserves the serious consideration of the entire industry. Whether or not the program suggested becomes effective, the fact remains that the industry has now before it a workable schedule under which production may be brought in balance with the market demand.

The recommendation of the committee that existing stocks of crude be drawn upon at the rate of 78,000 barrels daily and that stocks of gasoline be reduced is significant in that this policy is a direct reversal of the industry's practice of annually increasing its stocks of crude and products. The report also suggests an allocation of daily production requirements as between the larger producing states, adjusted so as to relate to the last nine months of this year. California and Oklahoma have made serious efforts to effect conservation and are producing approximately the amount of their allocations. The production in Texas is considerably in excess.

The degree of prosperity experienced by the industry has been demonstrated to tend in inverse ratio to the amounts of surplus crude and products it carries from year to year. The extent to which both producers and refiners recognize that not volume of production, but the ability to measure production to fit the requirements of the consuming markets as these requirements arise, will determine the future of the industry.

Compagnie Française des Pétroles

Handicaps and Obstacles in Collaboration of the Company with Successive French Governments in Regard to Iraq Oil Are Reviewed in Annual Report and President's Statement

MATTERS of considerable interest to many alien oil companies are covered in the report of the Compagnie Française des Pétroles, issued in Paris during the early part of this month, and in the statement of Colonel Mercier, president of the company, at the annual general meeting.

Since accord was reached on the rights of the groups composing the Iraq Petroleum Co., Ltd., states the report, the relations between the groups have been facilitated and full collaboration has become possible in the prospecting and development of the Mesopotamian oil fields.

It has given a new impulse to the operations of the Iraq Petroleum Co. Thus, recently a mission was sent to determine the detailed plans of the pipe line, the general outlines of which had been drawn by two earlier missions. It is now possible to look forward to the start of construction on this undertaking before the end of the present year. Two years probably will suffice for its completion, the physical difficulties of the work apparently not being unduly arduous.

The Iraq Co. has made all necessary arrangements for a sufficient number of wells to be drilled during the interval to run the line to capacity. A minimum annual production of 4 million tons (28,000,000 barrels) of crude is contemplated at the start of pumping operations. A considerable quota of this production is already assured from completed wells that have been shut in.

Both the Compagnie Française des Pétroles and the Iraq Government have received formal assurance from the Iraq Petroleum Co. that the development of the petroleum concessions will be prosecuted without delay. The drilling activities, of which mention is made further, corroborate this declaration.

Early in 1929, continues the report, the French Government requested the Compagnie Française des Pétroles to agree to a modification of the contract of 1924 governing the connections between the State and the company.

The Government therefore considered the time had come to modify the connections between the State and the company, and the Compagnie Française des Pétroles acceded to the request. The action of the directors was ratified by the stockholders of the company on March 20, 1929.

The contract with the State, signed March 19, 1929, still lies before the French Parliament. The task of obtaining a decision from the Chambers rests with the Government, but, whether or no the new contract is put into force, the Compagnie Française des Pétroles goes on record that it will continue its corporate activities.

In line with the spirit of the petroleum laws of March 13 and March 31, 1928, the C. F. P. announced in last year's report that it would immediately form a refining company, the Compagnie Française de Raffinage. The new company was incorporated last year with a capital of 100 million francs.

Under the terms of the contract of March 19, 1929, the French Government will have the right to subscribe 10 per cent of the capital in the new company. Inasmuch as the State will eventually hold 25 per cent of the stock of the Compagnie Française des Pétroles, which owns 55 per cent of the stock in the new refining company, the State holding in the Compagnie Française de Raffinage will be substantially 25 per cent.

The C. F. P. has provisionally subscribed the holding reserved for the French Government and therefore holds at present 65 per cent of the stock of the new refining company. The balance of the stock, continues the report, is held by six French companies, which have made exclusive purchase agreements with the refining company for products from the new plant. The C. F. P. has contracted with the refinery for the supply of crude.

Thus finally the Compagnie Française des Pétroles has rounded out its connections from the source of supply to the refinery output, and that was one of the essential aims assigned to it.

Following the above summary of the policy and organization of the C. F. P., the report refers to the principal financial operations of the C. F. P. during last year.

Due to the increase of the capital of the Iraq Petroleum Co., Ltd., last November from £3,000,000 to £4,000,000 the Compagnie Française des Pétroles subscribed to 237,500 new £1 shares, on which 6 shillings have been paid. Its total investment in the Iraq company amounts now to 950,000 £1 shares.

Increased activity has been shown in the drilling operations in Iraq. The Baba-Gurgur field has been proved to cover a larger area than the early drilling had shown in this structure. Last year the total drilling amounted to 13,431 meters (44,322 ft.), bringing the record from the start of operations up to a total of 24,139 meters (79,659 ft.).

Outside the Iraq investment, the Compagnie Française des Pétroles has holdings in several other undertakings, to which the report also refers.

Investments shown on the company's books are:

O. P. Q. Association	fr. 480.335.82
Iraq Petroleum Co.—Shares and direct expenditure	92.001.741.42
Compagnie Française de Raffinage	16.250.000.00
Société de Prospection Géophysique	1.242.000.00
Société Immobilière Haussmann-Messine	1.498.856.40
Société Chérifienne des Pétroles	727.189.96
Syndicat d'Etudes et de Recherches pétrolières du Maroc	50.000.00
Colombie	2.650.000.00
Participations diverses	190.650.00

Of this total, amounting to over 115 million francs, the increase in 1929 represented more than 44 million francs.

The Société de Prospection Géophysique, which had hitherto confined itself to the long and detailed task of training crews of engineers in the different methods used, has now commenced operations. Several companies have engaged the services of this organization for geophysical surveys. The French Government has also entrusted to it the study of the Gabian field.

During the past year the activities of the Compagnie Française de Raffinage were directed principally to the planning of the two refineries to be built, one, near le Havre, on the Tancarville Canal, to be known as the Normandy refinery, and the other, on Berre Lake, not far from Marseilles, to be known as the Provence Refinery.

In Morocco certain projects and operations undertaken by the C. F. P. in collaboration with the French Government have led to an investment in the Société Cherifienne des Pétroles of fr. 727,190. The Colombian investment has been further amortized by about one million francs.

Income during the year, derived wholly from interest on deposits at the banks, was sufficient to cover not only general expenses, but also the small deficit from the previous year and an amortization of the Colombian investment.

The company's viewpoint in its relations with the French Government were very clearly set out by Colonel E. Mercier, president of the Compagnie Française des Pétroles, in his address to the stockholders at the annual meeting.

Balance Sheet, as of December 31, 1930

Compagnie Française des Pétroles

Assets		Liabilities	
Incorporation, office and furniture..	fr. 4.00	Capital Stock	fr. 150.000.000.00
Cash and deposits at bank	32.870.865.89	Special Bank Account	243.850.00
Investments	115.091.775.60	Administration de l'Enregistrement.	155.219.15
Real estate subsidiary	2,410.637.60	Accounts payable	38.517.31
Accounts receivable	64.305.37		
	fr. 150.437.586.46		fr. 150.437.586.49

He recalled it was by the Treaty of San Remo, signed in April, 1920, that France obtained recognition of the principle of 25 per cent participation in the Mesopotamian oilfields. A subsequent covenant, signed in January, 1921, transferred to France the former German holdings in the Turkish Petroleum Co., amounting exactly to 25 per cent of the capital of that company, which had the original concession to explore for oil in Mesopotamia.

Two courses were then open to the French Government, either to retain the holding itself or to transfer it to a French company. The Government took plenty of time to decide. Three years passed by. Finally the decision was made to turn the holding over to a private company, without any financial assistance from the State and at the company's own risk and peril.

The Government did, however, in the person of Poincaré, draw up a list of the oil companies that should be called upon to subscribe the capital, and Colonel Mercier was invited to organize the new company. The Government insisted that the founders' list should include the names of all French companies engaged in the oil business and also their subsidiaries in Poland and Roumania. Moreover, the way had to be kept open for any new French oil company to take part in the C. F. P. on an equal footing with the founders. Not even one of the original subscribers sought participation in the C. F. P., and several of the companies invited did not accept.

At that period, in 1923, great doubt existed about the extent and practical value of the Mesopotamian oil fields. Moreover many people doubted the possibility of success attending such a complex task, with its international difficulties and its conflict of French interests.

The first 25 million francs capital of the C. F. P. were raised solely in deference to the head of the government, Colonel Mercier stated, and then only after five months of toilsome negotiations and efforts.

As soon as the Compagnie Française des Pétroles had been formed, the State signed the 1924 contract with it. Complaint is made today that the contract did not give an adequate holding to the State, but that is not correct, averred Colonel Mercier. Complaint is also made that the contract did not provide for the State to subscribe capital. That is easily said in 1930, Colonel Mercier asserted, but when the contract was signed, it raised such strong and determined opposition in the board of directors of the C. F. P. (all representatives of oil companies) that the new company almost collapsed without reaching the first stage.

Also it is pretended that the contract was not ratified by the Parliament. That was not required, Colonel Mercier emphasized; no juridical authority can maintain the contrary, and the C. F. P. has nothing to fear on that score.

The assembly of the initial capital was laborious, but much more difficult yet were the subsequent operations when it had to be increased from 25 million to 50 million and then again to 75 million. To attain that goal, assistance had to be sought far beyond the ranks of the first stockholders, and the continued support had to be assured of the banking houses which had been drawn together in the foundation of the company.

Nobody in that distant period, stated Colonel Mercier, criticized the almost invisible advantages of the company, which was known to be engaged in a bitter struggle in London to protect the rights the State had transferred to it and which proved to be singularly precarious. Nobody at that time solicited the favor of subscribing at par to the capital of the C. F. P.

But the outlook gradually changed as the operations arduously conducted in Mesopotamia, at heavy expense in a difficult country, with the help of the C. F. P. engineers resulted suddenly in the striking success of Baba-Gurgur. There was no difficulty then in raising the capital from 75 million to 150 million francs, and the public began to show interest in the company. Meantime accord had been reached in 1928, terminating the difficulties encountered in London and completely transforming the situation bequeathed to the C. F. P. by the State, notably by assuring to the company at cost 23¾ per cent of the crude to be derived from Mesopotamia.

About that same period the French laws were passed regulating on the one hand the imports of petroleum products and on the other hand restoring the refining industry in France. Those laws presented to the C. F. P., as also to the other oil companies, certain problems which necessarily entrained new negotiations with the State. The State took advantage of that circumstance to reopen the discussion of the 1924 contract. The investment which the State had regarded as inopportune in 1924 appeared highly desirable in 1929.

Regarding himself, by reason of the task entrusted to him, as much the guardian of the State's interests as of the company's, Colonel Mercier related, he pleaded that the somewhat arbitrary aspect of the State's move be overlooked and that those who had run all the risks—financial, technical and legal—should sacrifice some of their rights in favor of the State. Actually that is what the stockholders agreed to in ratifying the new contract last year.

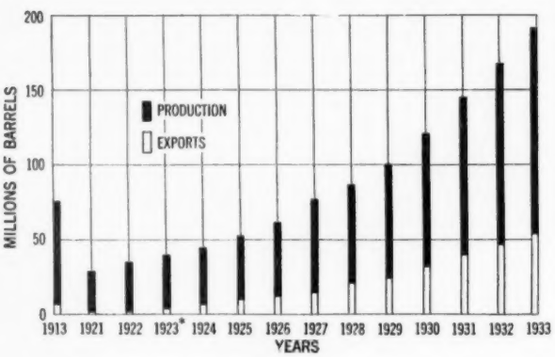
In conclusion, however, Colonel Mercier pointed out, it must be recalled that the C. F. P. did not solicit the new contract, but accepted it, and can therefore calmly await the parliamentary decisions on the matter.

At an extraordinary general meeting, following the annual meeting, steps were taken to enable the company to increase its capital, if necessary, before the new contract with the French Government is confirmed and put into effect. This provision was rendered necessary by the delay in the ratification of the contract by the State and in view of the possibility that the Iraq Petroleum Company may make a further call for funds, in order to proceed with developments in Iraq, to which the C. F. P. will pay its share.

Russia: 300,000,000 Bbl. in 1933

Soviets to Treble the Production of Crude by the end of 1933 in Order to Increase the Exports of Oil Products to Pay for the Imports of Foreign Products Needed by Russia

ONE OF THE most profound changes ever experienced by the world's oil business is forecast by the expansion of Russia's petroleum industry. According to the revised 5-year plan of the Soviets the petroleum production of Russia is scheduled to attain a rate of 40 million tons (say 280,000,000 bbl.) in the fiscal year 1932-1933. Gasoline and kerosene from the Russian refineries will amount that year to a total of 18,600,000 tons (say 150,000,000 bbl.), a great part of which will be offered in the world markets.



** From 1925 onward, the year shown is the fiscal year ending Sept. 30.*

Russian Oil Exports 1929-1933, Extended from Records 1913-1929, on Basis of Original 5-year Production Plan

In the chart hereabove is indicated the schedule of production and of exports according to the original 5-year plan. These figures seem to have been increased by about 33 per cent as regards production and about 50 per cent as regards exports. The original schedule showed exports in 1932-1933 amounting to about one-third of the current volume of exports from the United States: the revised schedule is apparently equivalent to a Russian export total in 1932-1933 amounting to one-half of the present annual rate of exports from the United States.

Though expansion of all industries in Russia and a program of highway construction that will lead to a development of automobile transportation will create an augmented demand of oil products for domestic consumption, nevertheless the major proportion of the Russian oil products must find an export outlet.

Petroleum is Russia's principal aid in the creation of foreign funds. The Soviet republics can more quickly build up foreign balances by expansion of their oil industry than by any other means. Under the necessity of buying abroad much of the machinery essential to the establishment of its domestic industries, Russia must build up foreign funds by exports, foreign loans being unavailable to her. Export sales of petroleum products are therefore more a matter of expediency to the Soviets than a matter of price. In this light one should view the scheduled refinery production for three years.

1930-31

Total yield	19,700,000 tons
Gasoline and Kerosene	7,700,000 tons
Mazut (fuel oil)	7,700,000 tons

1931-32

Total yield	25,400,000 tons
Gasoline and Kerosene	11,500,000 tons
Mazut (fuel oil)	8,000,000 tons

1932-33

Total yield	33,400,000 tons
Gasoline and Kerosene	18,600,000 tons
Mazut (fuel oil)	6,700,000 tons
Lub. oils	2,100,000 tons
Petroleum coke	1,000,000 tons
Asphalt	1,000,000 tons

Drilling has to be increased simultaneously, not only to increase production but to find new pools. Whereas during the current fiscal year the drilling in established fields is scheduled to attain 435,000 meters (1,435,000 ft.) and in prospect holes 117,000 meters (386,000,000 ft.), next year's schedule will be more than three times as big. Production drilling in 1930-31 is set at a total of 1,480,000 meters (almost 5,000,000 ft.) and exploration drilling at 410,000 meters (1,350,000 ft.). These figures are considerably bigger than those given on page 92 in the March issue of World Petroleum. If one assumes an average well depth of 3000 ft., the total number of holes to be drilled in Russia during 1930-31 may be regarded as two thousand.

It is difficult for the mind to comprehend the magnitude of this expansion program, and still more difficult to vision the consequences in world business. The picture begins to take form when one gets the outline of the refinery expansion proposed for the next fiscal year 1930-1931, dating from October 1st next. The year's program of refinery construction embraces:

25 pipe stills and 11 small plants
11 pipe stills for fuel oil refining
115 cracking plants
400 coke shells
2 plants for bright stocks

Need for this prolific refinery construction is obvious when one glances at the scheduled refinery runs for the next three Soviet fiscal years. The schedules call for:

1930-31 Run to stills—21,400,000 tons
1931-32 " " " 29,000,000 tons
1932-33 " " " 40,000,000 tons

Two striking factors are the relatively small investment involved and the undoubted economy of operation that will be attained. With the latest and most approved methods of drilling, with the economy of electric power throughout the fields, with the newest and highest yielding refining and cracking equipment, with wages averaging about $45 per month, and the personnel highly trained and permanent, the costs of production will probably be lower than in any other fields. Of royalties there are none, and taxation probably does not touch the industry.

The announced oil program of the Soviet Republic is replete with material for study and consideration by the oil industry in all countries. Large, productive fields will be developed as units. Well spacing will be determined by the geologists and not by the size of town lots. Oil chemists and refinery engineers of Russia, who have always been notable in proficiency—though language difficulties have obscured this from the general knowledge of the world—will have full opportunity for the use of their talents.

From the technical aspect, even as much as from the commercial standpoint, the progress of the Soviet oil industry should be closely followed in all its phases.

Camp of Cia Industrial y Comercial de Pétroleo, S. A., Comodoro Rivadavia Field, on the Argentine Coast

Operations in Argentine Oilfields

Review of Activities of the Fiscal and Private Companies Producing in the Four Fields of the Southern Republic of South America

By D. M. Veysey

ARGENTINA, the second largest country in South America, has an area of a little over one third that of continental United States, 2½ times that of Venezuela or 4 times that of France, and has four oil fields to supply its population of about nine people per square mile. Last year its total production of petroleum was about 9,400,000 bbl., which was refined and consumed within the country together with over one million metric tons of oil imports. In 1928 this importation amounted to 1,124,207 metric tons, of which 317,466 were refined in Argentina.

While at present producing somewhat under 40 per cent of its requirements, the Argentine with free and unrestricted enterprise has a fair chance of becoming fully self providing as to oil. In the comparative production of Argentina, Peru, Colombia, Trinidad and Venezuela in 1921 Argentina stood second, with Peru first. Since 1926, while the other South American countries have gone up the scale, Argentina has slipped down to second from the last and is importing crudes from Venezuela, Peru and Mexico.

To assign any single specific reason to this retardation is not possible, but without a doubt the suspension of progress among private operators has been to a certain extent responsible. The outcome of petroleum legislation is being awaited which will result either in a government monopoly of this industry or in a revision of the petroleum laws. No rights to explore have been granted in reserve areas since December, 1924. Activity since then has been limited to previous acquisitions. Permits for construction are not being acted upon in Buenos Aires Federal District.

Government Activities

Argentina's most important producing company is the government owned and operated Y. P. F. (Yacimientos Petroliferos Fiscales). Its 604 wells in 1928 yielded 742,204 cubic meters (about 4,675,750 bbl.) of petroleum. In 1929 its 878 wells are estimated to have produced 5,481,735 bbls. The principal operations of the Y. P. F. are in Argentina's largest field, Comodoro Rivadavia, around the coastal town of the same name, whence it extends north for 15 miles and inland about 20 miles. In 1907 the Government organization accidentally struck oil while drilling for water in this region and has ever since been interested in petroleum operations.

Y. P. F. wells are not driven to a depth beyond 3000 ft., rotary tools being used for about the first 1500 ft., and cable tools the rest of the way to the oil. Original drillers were mostly Roumanian, German, Polish, etc., with occasional Americans employed on contract, the latter of whom were largely responsible for the introduction of rotary tools to replace the original Fauck equipment. The bit used on the rotary equipment is the simple fish-tail kind, no roller bit being necessary. Production is obtained by pumping and swabbing, no air or gas lifts being employed in flowing the wells. Last year the field was electrified, and electric compressors have now been installed in place of the gas engine driven compressors formerly used at Comodoro Rivadavia.

About 30 strings are in operation. Only two wild cats are being drilled between 60 and 80 miles inland, with no definite results reported to date. This field is considered to have reached and passed peak production. The crude is shipped by water to Y. P. F. refineries at Bahía Blanca and at La Plata (near Buenos Aires).

Second in importance among the Y. P. F. operations are those at Plaza Huincul, an inland field in the Gobernación of

Neuquen, near the town of Zapala, western Argentina. The Government completed the discovery well there in 1918. At Plaza Huincul, Y. P. F. production is second to that of the Standard Oil Company, (Sociedad Anónyma Argentina), the estimated amount for 1929 having been 420,000 bbl. against the 558,434 bbl. of the Standard. The product from this field is shipped by rail to Bahía Blanca, directly east on the coast.

In the extreme northern part of Argentina lies the third, and newer field of Salta, in the province of Salta, near the town of Orán. At Salta the Y. P. F. produced in 1929 an estimated total of 12,582 bbl., as against the 188,583 bbl. of the Standard Oil Co., the only competitor in this field. Each company has a small refinery in this district, producing sufficient for the local needs.

With the assistance of the Department of Mines, the Y. P. F. has done geological work in many parts of Argentina. It is also interested in geophysical work, but has not yet done much actual work along these lines, although it is reported to have recently begun geophysical work over certain areas in Salta, using both the torsion balance and the seismograph.

The Y. P. F. took the initiative in creating the extensive petroleum reserves of Argentina, which now comprise all but a fraction of 1 per cent of the area open to petroleum operations, the minute remainder being left to private operators. With increasing age this company is becoming more wholly Argentine in staff, partly by naturalization, partly by preference.

On January 10 the Dirección General, Y. P. F., called for bids for 100,000 meters of 10-inch seamless steel pipe for 70 atmospheres pressure. This will be followed by a series of calls for bids for a supplementary 400,000 meters of pipe to be used in the construction of a pipe line between Plaza Huincul and Bahía Blanca. Another Y. P. F. project is the building of a new cracking plant. These are the only construction enterprises now definitely projected among the oil companies of Argentina.

English Railways

Second in Argentine production is the Cía. Ferrocarrilera de Petróleo, S. A., operating in the northeastern part of Comodoro Rivadavia field. This is the producing company of the British railways of the Republic and has about 100 wells in production. Three or four wells are being drilled with rotary and Star equipment, a fish-tail bit being used down to near the oil sands, followed by a core drill, the rock not being hard enough to need a roller bit. Having a gas flow of around 5 million cubic meters a day at 500 lb. pressure, which they run through their extraction plant and return to the field to flow the wells, they are using no artificial compression. In 1929 this company produced an estimated quantity of 1,527,276 bbl.

Cía Astra-Eastern

The third largest producing company of Argentina is the Astra-Eastern, with an estimated total of 738,464 bbl. for 1929. It is an Argentine concern, the refining company of which is known as the Itaca, with a plant at Campana, near Buenos Aires. Drilling operations consist of 3 to 4 strings with Fauck and rotary tools in use. The Astra is the only private company with a wild cat in progress, one being in the process of drilling about 1 kilometer from production in the northern part of Comodoro Rivadavia field. Unlike the other private companies in this field, Cía. Astra has no competitive off-setting, having promptly limited its discovery pool with dry holes. It has interests also in the Plaza Huincul field, where it has one string in progress, but as yet no production.

Royal Dutch and Anglo-Persian

Other companies operating at Comodoro Rivadavia field are the Cía. Industrial y Comercial de Petróleo, S. A., (Anglo-Persian), the Diadema Argentina de Petróleo, S. A. (Royal Dutch-Shell) and the Cía. Solano, an Argentine company. They had respectively estimated totals of 531,740 bbl., 106,125 bbl., and 70,279 bbl. for 1929. The Anglo-Persian concession lies in the western part of Comodoro Rivadavia field, while that of the Shell is in the northwestern part. The former has three to four strings of wells going, using rotary and Star equipment, with fish-tail bits, while the Shell has one or two strings being drilled with rotary type. The Anglo-Persian has 130 wells and can drill no more, its leased area being entirely circumscribed with government wells. Although considered to have the most promising ground in this field, the Diadema has been shut down due to the inability to secure permission to operate a refinery near Buenos Aires, settlement of which problem is being awaited. This shut-down, which was complete during December, 1929, was responsible for a decrease of 257,506 bbl. in its production since 1928.

The Standard Oil, Gulf and various Argentine companies have drilled in Comodoro Rivadavia Field, but failed to obtain production.

Standard Oil Co., S. A. A.

Next to the English Railways the Standard Oil Company is the largest foreign producer of petroleum in Argentina, being the main operator in Plaza Huincul and Salta fields, although the Y. P. F. has 11 to the Standard's 3 strings in opera-

A well on the pump Comodoro Rivadavia

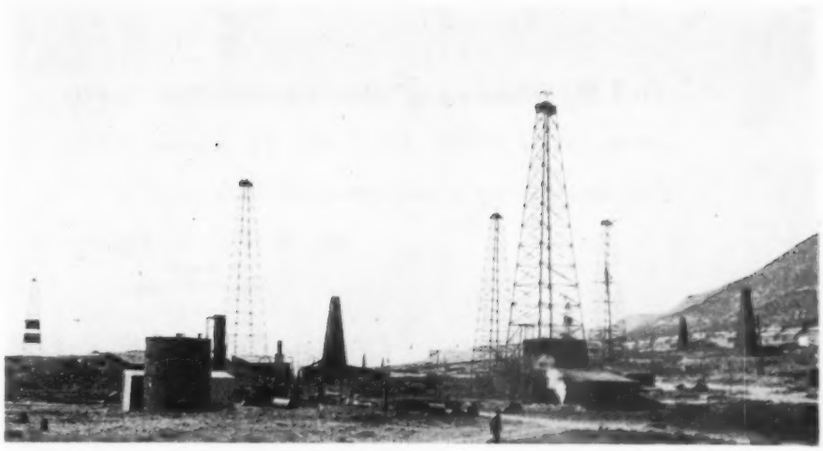
tion at Plaza Huincul. Throughout both of these fields the Standard, as well as the other companies concerned, uses cable tools.

Standard, which has been 10 years in the north, was responsible for proving the Salta field. At its refinery in this section it manufactures 500 bbl. of petroleum products daily, supplying local demands. Standard continues to look northward, as exemplified by its interests beyond Salta, across the Bolivian border, where it has about 2½ million acres at the foot of the Bolivian plateau, and is doing extensive exploring and wild catting. When adequately proved, the Bolivian field will present a transportation problem, the first of the twenty-one present wells having been 300 miles from the nearest railroad. A pipe line will at some future time have to be laid across the plains to the nearest navigable tributary of the Plata River.

Other Operators

Cía. de Challacó (Sol) and Cía. Río Atuel, Ltda., both privately owned Argentine companies, complete the list of operators in that country. The former is active at Plaza Huincul (76,285 bbl. estimated in 1929) with drilling operations consisting of 2 strings of wells. Cía. Río Atuel is the only company with production at Mendoza field, having obtained 10,383 bbl. in 1929. Mendoza field is north of Plaza Huincul, near the western border of Argentina, on the Atuel River, Province of Mendoza, and is the newest field of petroleum enterprise in the country. The Standard Oil Co., Astra, and Y. P. F. have experimented there with cable tools.

Deepening a well at Comodoro Rivadavia



Anglo-Persian refinery at Comodoro Rivadavia

Reaching the Fields

All Argentine oilfields are within three days' distance by railroad from Buenos Aires. It is possible to fly from the capital to Salta weekly by NYRBALINE, and from Bahía Blanca to Comodoro Rivadavia by the national airline. The most usual way of reaching Comodoro Rivadavia from Buenos Aires is by coastal steamer, a trip of five days. Motoring to the fields is seldom practical because of adverse highway conditions.

Daily Production

The tabulation hereunder, based on December, 1929, results, gives an approximate idea of the comparative average daily rates of Argentine crude production in the various fields and the relative activities of the different companies.

Comodoro Rivadavia

Y. P. F.	15,100 bbl. per day
English Railways	4,100 bbl. per day
Cía. Astra	2,100 bbl. per day
Anglo-Persian	1,340 bbl. per day
Cía. Solano	80 bbl. per day
Royal Dutch	Shut down

Plaza Huincul

Standard Oil Co.	1,750 bbl. per day
Y. P. F.	1,450 bbl. per day
Cía. de Challacó	200 bbl. per day

Salta

Standard Oil Co.	500 bbl. per day
Y. P. F.	40 bbl. per day

Mendoza

Cía. Río Atuel, Ltda.	30 bbl. per day

All Fields

Total	26,690 bbl. per day

Drilling Operations

Drilling operations and methods have already been discussed, but the following depths may be noted in tabular form:

Comodoro Rivadavia

Maximum	950 meters (about 3135 ft.)
Minimum	520 meters (about 1715 ft.)
Average depth	650 meters (about 2145 ft.)

Plaza Huincul

Maximum	1250 meters (about 4125 ft.)
Minimum	380 meters (about 1255 ft.)
Average depth	800 meters (about 2640 ft.)

Typical Crudes

Comodoro Rivadavia Crude

CHARACTERISTICS

Gravity at 15°C.	20.2 A.P.I.
Flash Test	152° F.
Color	Black
Odor	Sweet
Visc. Saybolt at 122°C.	106 Sec.
Chill	22° F.
Base	Asphalt

ENGLER DISTILLATION

Initial B.P.	279°C.
Per cent 279°C.-290°C.	1.0
Per cent 290°C.-315°C.	5.0
Per cent over 315°C.	94.0
Chill Test	40° F.

Plaza Huincul Crude

CHARACTERISTICS

Gravity at 15°C.	32.3 A.P.I.
Total Sediments	18.0%
Water	53.0%
Visc. Saybolt Univ. at 50°C.	61 sec.

ENGLER DISTILLATION

Initial	81°C.
Per cent at 150°C.	13.3
Per cent 150°C.-300°C.	31.5

SUBSCRIPTIONS received from many large companies show that they have been quick to realize the value of World Petroleum to their executives and their more ambitious understudies. May we ask you to bring this new publication to the attention of your key men?

Drilling Today and 10 Years Ago

Full Significance of Modern Drilling Appliances Is Vividly Realized in These 1930 Impressions of a Returned Driller of 1920

By Walter H. Jeffery
Author of Deep Well Drilling

IN CABLE tool methods there have been few changes during the past 10 years, but there has been steady improvement in the equipment used. Wood derrick and wheels have largely given way to steel derrick, steel band wheel, bull wheel and calf wheel. For deeper drilling the chain-driven sand reel has superseded its friction-drive older brother, and the modern roller-bearing steel crown block with manganese steel sheaves has displaced the old block with journals and cast iron sheaves. The old blocks would not stand the grief of pulling tools and bailing at 5000 ft.

In prime mover equipment also there has been considerable improvement. Steam boilers of 55 to 75 nominal hp. now are used in place of the old 30-40 nominal hp. boilers, for it has been found that reserve steam power greatly reduces the time in pulling tools and in bailing. Also, by the use of low pressure gas burners with the larger boilers the cost for fuel has been cut in half. During recent months the adoption of steam superheaters and the thermal siphon have added further to boiler efficiency. The gas engine, particularly the multiple cylinder vertical type, has to a considerable degree taken precedence over the steam boiler and engine where feed water is poor in quality or of meager supply.

For shallow drilling the spudder type drilling machine with gasoline engine, which can be driven over roads by means of its own traction, has largely displaced the old type steam driven outfit.

At Kettleman Hills
136 ft. modern derrick

Cable drilling tools have changed little, but notable new devices are the spiral stem, spiral bit, improved temper screw clamps and new ingenious fishing tools.

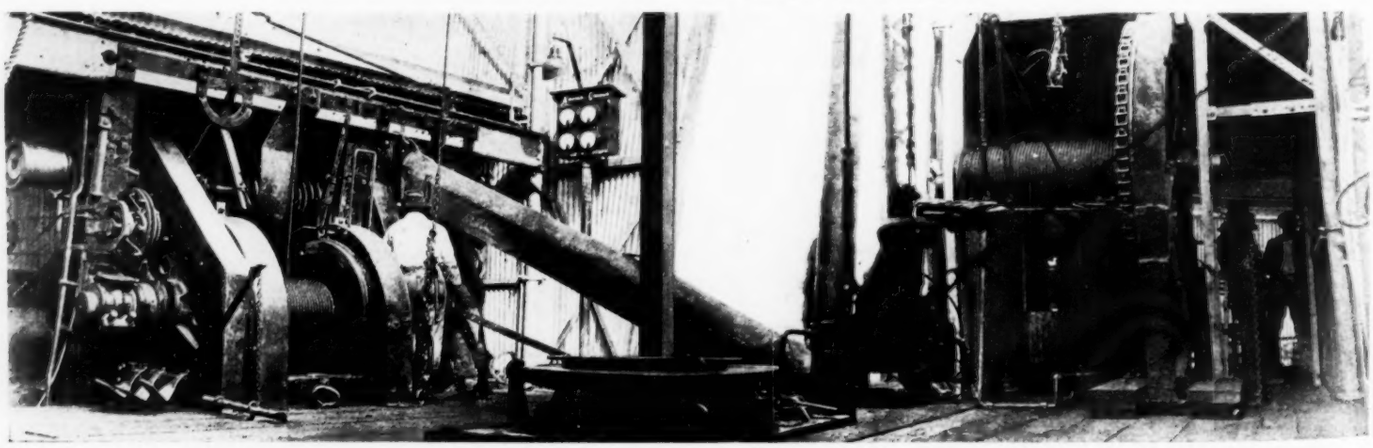
In rotary drilling there have been greater changes in methods and more improvements in equipment during the past two to three years than in the 10 years preceding. The drilling of the 6500 ft.-9500 ft. wells in California and in Oklahoma have required different and better equipment than that which had so well served the purpose of shallower drilling theretofore. Today a 5000 ft. well in California is considered a shallow hole.

Ten years ago derricks 88 ft.-112 ft. in height answered the purpose. There were no crowsnests nor outside double, triple or quadruple platforms on those old derricks. A few planks laid across the derrick girts served the purpose, and woe to the derrick man who lost his balance.

Deeper wells, requiring more stands of drill pipe and of casing to be stacked in the derrick, called for taller derricks with larger floor space, and then came the 122 ft. derrick with 24 ft. base. About that time the California Industrial Accident Commission stepped into the picture with a set of regulations requiring outside drill pipe platforms and safety railings for them and for the crowsnest. Then the rotary derrick began to resemble the military mast on a U. S. warship. The 122 ft. derrick has been followed during the past year by the 136 ft. and 156 ft. derricks, and now there are in use in California several wood derricks 170 ft. in height. This development has been too fast for the steel derrick manufacturers, and steel derricks are not available in this latter height.

A rotary driller who passed out 10 years ago and who might be privileged to return to look at a modern derrick and rig would rub his eyes and gasp. Certainly he would not know how or where to start to rig up one of these rigs. The safety appliances alone would amaze him: the guards over rotary and draw works chains, the apron in front of the draw works drum, the outside platform rail-

View of modern rotary derrick floor, showing electric-driven draw-works and rotary



ings, the inside metal platforms—some movable and operated with a lever—, the steel bars extending the length of the derrick to form a safety cage around the man ascending or descending the ladder, the safety line from the outside drill pipe platform on which a trolley or cage slides to the ground to carry him to safety in the event of blow out or fire. He would lose his way among the rooms of a modern derrick: rotary engine house on one side, standard or auxiliary hoist engine house on the other, clothes changing room, loafing room, core room, basement in which mammoth slush pumps now are placed. The core room with its rows of cores would interest him.

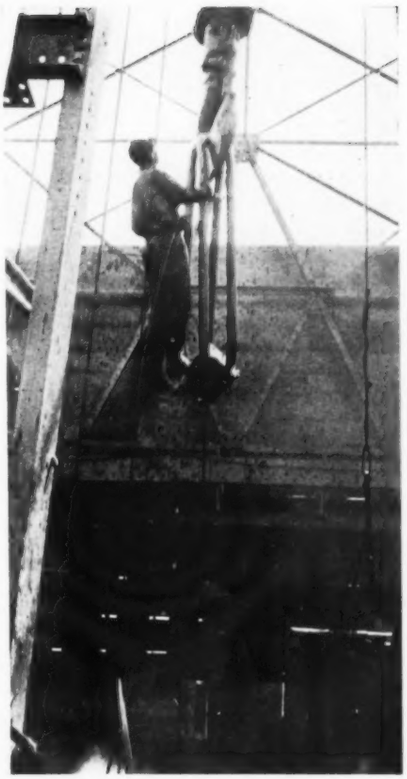
"What are those things?" he would ask.

"When drilling near or in a possible oil or gas horizon or in a formation where it may be desirable to set casing we run a core barrel to take cores of the formation. The cores are collected by the geological staff, taken to the company's laboratory, and carefully examined for showings of oil or gas or to determine a suitable shale bed in which to set casing." Then he would be shown how a core barrel works.

He would ask what that other house is for, the house down the hill with tanks, slush pump, etc. "That is the mud mixing outfit," he would be told. And (shades of his brethren across the Styx) "what is that neat little house standing alone out there?" None other than an outside toilet of the old farm variety, but painted and kept clean. And "what is this square steel box thing standing on one side of the derrick floor," convenient to the men's reach? A drinking water cooler with bubbler, so help him.

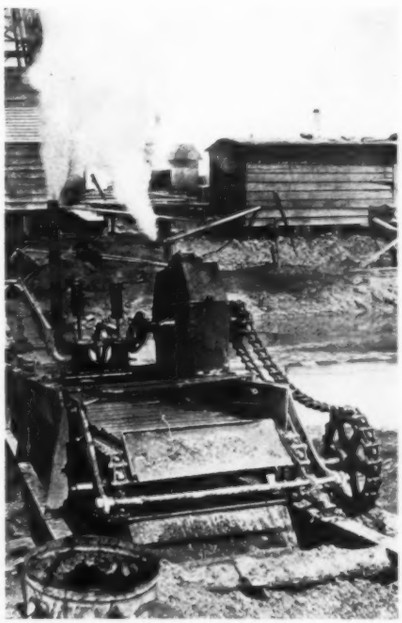
Next he would see several large gauges and would learn they comprise the weight indicator, a device to tell the driller how much weight he is carrying on his bit. In his day if they paid any attention to this at all it was by means of a crude arrangement to determine the squat or compression on the wood derrick due to the weight of the pipe suspended from it, but the advent of the steel derrick put the old squat indicator out of business.

He would see an electric motor with a differential drive operating the regular draw works and rotary, a motor-driven slush pump, and, for use in case the electric current fails, steam boilers and engine to drive the calf wheel and sand reel or auxiliary draw works. The old familiar bull wheels he used on a combination rig are missing. In place of the old rubber hose that he used he would see steel rotary hose, and instead of the make and break rotary used in his day to break joints he would be confronted by a new cathead with an extra wire line sheave, engaged by means of a clutch.



Ascending the derrick on the "elevator" or "lift"

Shale separator, screening the mud returns for re-use



Taken out to watch the roughnecks mix some mud fluid, he would have to ask what the stuff is they pour from paper sacks into the mud. "No, it is not cement; they are not cementing casing yet," he would be told in answer, "but the high pressures in the deep wells of today require a heavier mud to prevent blow outs. So they are mixing a reagent with their mud to make it heavier, twice as heavy if necessary." Turning away he would spy a device resembling a moving belt, consisting of many small screens with a small turbine engine or electric motor driving it.

"What's that thing?"

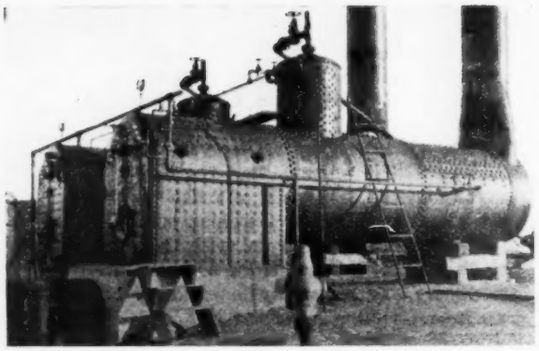
"Oh, that! It's our shale separator. It picks up the mud returns out of the trench, carries them out, and the mud fluid falls through the fine screens, while cuttings and sand are carried to where the screens turn over on their return and are dumped out."

"Did some kid leave his beach pail and those small steelyards here?" he would ask.

"Oh, no! We use those to weigh our mud. We have to maintain the mud up to a certain weight, so we weigh the returns occasionally, and now they are talking of a continuous mud-weighing indicator and recorder."

On the way back to the derrick he would stop at the row of boilers, all connected up so their steam could be compounded. He would see a pair of small steam pumps connected with an intricate assembly of valves and fittings to take cold water from the supply, circulate it through the feed water preheater, heat it with exhaust steam and conduct it hot to the several boilers. That would lead his mind back to the injector and hand operated pump of his day. He would be shown a master lubricator by means of which the steam going to the engine and slush pumps carries lubricant, and he would note, too, that force feed lubrication is a feature of all the machinery.

Back in the derrick again, he would recognize among an assortment of bits the old fish-tail and roller rock bit, but what of these other drag, multiple cutter and new fangled bits that have cutters working at an angle from the vertical? Surely this last bit would drill itself off into a bad crooked hole, he would venture, only to be assured that one bit drills about as straight as another, but most of them cut gumbo and shale much faster than his old fish-tail. And he would see them screw one of the bits into a massive drill collar 20 or 40 ft. long. The drill collar of his day was an extra long one if it measured 6 ft. He would learn that long collars are used to absorb the severe torque at the bottom of the drill pipe and to



Boilers at Kettleman Hills

assist in keeping the hole straight, for they are larger in diameter than the drill pipe and more nearly approximate the diameter of the hole.

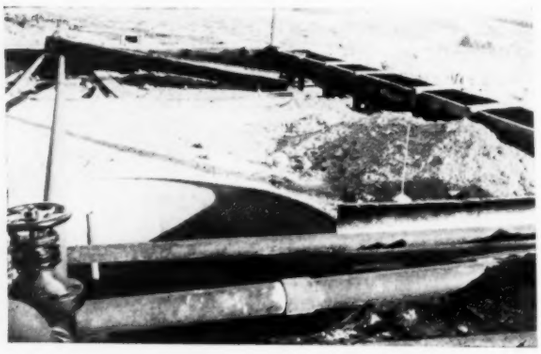
"What are those rubber things on every other joint of drill pipe?" the old man would ask.

"Rubber drill pipe protectors," the reply would be, "to prevent friction and wear on the pipe in the hole. We regard the rubber protector as about the most useful addition to well drilling equipment we have had in the past 10 years."

He would see a floor man moving about with a high pressure grease gun, shooting grease into various Alemite nipples on the different pieces of machinery, and another man with an acetylene torch welding some very hard facing metal to a fishtail bit, so that it would resist abrasion. One member of the crew, at least, he would be informed, is expected to be able to use a torch and is constantly called upon to do his stuff in many ways. In the old driller's time they wore out the fishtails and threw them away, and if anything was to be welded they had to send it to a shop.

Drill pipe the old driller would see put in much faster than he was ever able to do it. Modern outfits, with their ample steam or electric current supply, their four to six-speed draw works, roller bearing crown and traveling blocks, improved side-gate quick-snap-on elevators, counter-balanced, improved throw-on and -off tongs, all working as smoothly as a modern automobile, enable men to run in or

Mud trench and tank



pull out drill pipe in half the time required even five years ago. And the old boy would be intrigued at the way they screw up the pipe, spinning the pipe up with a rope from the cathead opposite the driller's position until the taper thread has made up as far as the spin will take it, and the joint set up by a quick tug by the driller using a cat line from the cathead on his side of the draw works to the tongs. Immediately the slips are pulled up from the rotary table the pipe is on its way down the hole. And these new drill pipe slips: two slips 18 inches long, in place of the three or four slips 8 or 10 inches long that he had used.

After all the pipe is in and just before the Kelly joint is screwed on, our old driller would see one of the men—who had been busy back in the engine house fixing a funny looking gadget—come out and drop it down the drill pipe.

"What's that?" the old timer would gasp with his drillers' horror at dropping anything down a hole.

"Why, that's the acid bottle bomb."

"The what?"

"The bomb we put the acid bottle in, to be etched so the bottle will indicate at what angle, if any, the hole has deflected off into a crooked hole."

"But you dropped that bottle to the bottom of 8000 ft. of pipe; won't it break?"

"Oh, occasionally, but not often. You notice the bomb has springs to fit the openings in the tool joints and keep it from falling too fast. If it sticks in the pipe it will move on down when we start the pump."

With the kelly joint screwed on and lowered, and with the drill pipe slips replaced by the square driving bushings, the modern driller turns his telegraph wheel, throws in his clutch and drilling commences.

At this juncture, 4 o'clock in the afternoon, a new crew comes on tour. "Well, I'm off tour now until 8:00 tomorrow morning," remarks the modern driller.

"How come," the old timer would say, "don't you work 12-hour tours?"

"Oh no, since they passed a law in California, we have three shifts: morning tour, midnight to 8 o'clock; day tour, 8:00 till 4.00; and afternoon tour, 4 until midnight."

"Take the old boy over to see them drill with that new hydraulic outfit," the 1930 driller would say to one of the roughnecks relieved from tour. So he would be taken over to the adjoining lease, where on the derrick floor he would see the perhaps most up-to-the-minute rotary drilling outfit yet developed. Gone are the rattling, snapping chains. This outfit is direct shaft-driven and runs in rollers, balls and grease as smoothly as a sewing machine. The shafts are below the derrick floor, out of sight and out of the way of human feet. The table stands 4 ft. above the floor, supported by two large hydraulic pistons that slowly sink as drilling progresses.

This, the old driller would be informed, is an application of a combination of the old diamond drill and hydraulic elevator principles, improved to the *n*th degree. The hydraulic idea serves a dual purpose: it enables the driller to maintain a uniform drilling pressure on the bit—registered and controlled from a set of gauge instruments in a frame a few feet from his drilling position—, and the steady, even descent of the pistons is a potent factor in keeping the hole straight and relieving torque on the drill pipe, thus preventing twist offs, fishing jobs, etc.

Twisted-off drill pipe has caused the old driller so much grief and profanity that he would ask how they go about it now to fish for broken off pipe, broken bits, etc., in 8000 ft. holes. Around the various walks and houses he would be shown an amazing assortment of improved overshots, lily lips, spears, under-reamers, and a new device with a slip joint that jackknifes into a dog leg position and enables circulation to be kept intact while the tool reaches out into a recess in the hole and picks out the fish reclining there.

"I want to show you how they put in 8000 ft. of 40 pound casing," the roughneck would say. "They are doing that now on this next well over there." Over there the old chap would see a six sheave traveling block weighing 7000 pounds and carrying twelve lines, a 9-inch alloy steel casing hook and a 1⅛ inch plough steel casing line.

He would see them stab a joint after first carefully brushing out the threads, washing them and finally applying dope to them. The joint of casing is first spun up from the cathead, as with the drill pipe, then set up as far as it is possible to screw it with the tongs also pulled from the cathead. He would ask, "But will this casing stand its own weight of 160 tons?"

"Oh, yes, it is being floated in on heavy mud and with one or more float collars set in it. Also, look at those couplings: They are longer and heavier than any you ever saw, and this casing is known as grade E, made of steel with a tensile strength of 110,000 pounds per square inch. In your day there was only one grade of steel used in all casing, of tensile strength about 30,000 pounds.

"That's enough," the old man would exclaim. "I once thought I was a driller, and a good one at that, but they are working too fast for me now. Lead me back to the Styx."

Why Holes Go Crooked in Drilling

Analysis of the Reasons for Holes Going Crooked in a Perfectly Homogeneous Medium and in Perfectly Horizontal Strata

From the Russian of M. Capelushnikov

Consulting Engineer
Asneft Trust, U. S. S. R.

SKIP the mathematics if you will, but read the article. It can be understood through the text alone. Production managers, superintendents and foremen can derive from it as much benefit as engineers, for it explains the mechanical laws that make holes go crooked in drilling. The influence of the laws is mathematically presented for those who might challenge the conclusions. This study furnishes the basic reason for the author's development of the turbo-drilling system.

DRILLING is responsible for the biggest costs in the petroleum business, and the reduction of this burden should be considered one of the principal problems in drilling technics. Exhaustion of the upper petroleum horizons has ordained the prospecting for petroleum at greater depths, which have already reached down to 10,000 ft., requiring very heavy machinery and great expenditure of power. Deep holes, as drilled by the rotary method, always become crooked, not only adding to the costs, but constituting also a jeopardy. Prevention of crooked holes is a great advantage.

The rotary system, which has been in use for almost 40 years, has been in its time the means of big progress in the problem of deep drilling, because, being simple and quick, it has given the more satisfactory commercial results. For this reason it has become the most used in all oil producing countries.

Regardless of its positive results, this system of drilling possesses, however, several defects, which in some cases make its application impossible.

The chief defect of rotary drilling lies in the making of crooked holes due to the transmission of power through a very long stem or pipe. The transmission of power from the motor to the bottom of the stem or pipe is very inefficient, causing power losses of 40 per cent to 60 per cent at ordinary drilling speeds and attaining even 75 per cent to 80 per cent.

Diagrams I, II, and III (figs. 1, 2 and 3) give the results of special experiments showing the loss of power in relation to the depth of the bored hole and to the speed of rotation. Diagram I illustrates the experiments performed without a drilling bit, while Diagrams II and III show the results of the experiments performed with rotary bits which did not work on the bottom.

These diagrams, giving straight line graphs, show that the loss of power increases directly with the depth. The speed of rotation and the diameter of the holes

Table 1
Measurement of Power Used by Rotary Drill System

No. of Test	Depth in Ft.	Strata	R.P.M. of Table	Total Drilling Power in K.W.	Friction Load in K.W.	Drilling Load in K.W.	Transmission Loss %
7	1501	Gray sand	71	56.3	15	41	27
8	2331	Gray sand	48	45.3	12	33.3	26
18	205	Clay	71	52.5	12	40.5	23
32	1224	Clay-sand	81	38	18	20	47
33	1795	Rock	83	30	20	10	67
34	2006	Sand and rock	81	28	21	7	75
35	2307	Oil sand	81	35	23	12	66
46	1472	Rock	67	39	15	24	38
73	1149	Hard sand	70	40	14	26	35
82	531	Clay-sand	68	48	12	36	25
83	538	Clay-sand	61	32	11	21	34
84	1152	Rock	28	42	7	35	17
84	1152	Rock	35	50	7.5	42.5	15
84	1152	Rock	42	60	8.2	51.8	14
84	1152	Rock	47	68	9.3	58.7	14
85	1152	Rock	28	48	7	41	15
85	1152	Rock	42	60	8.2	51.8	14
85	1152	Rock	47	62	9.3	52.7	15
89	538	Rock	44	20	8	12	40
89	538	Rock	46	25	8.5	16.5	42
89	538	Rock	52	40	9	31	22

Results of special experiments showing the loss of power in relation to the depth of the bored holes

Diagram I. 4-inch drill pipe and no bit

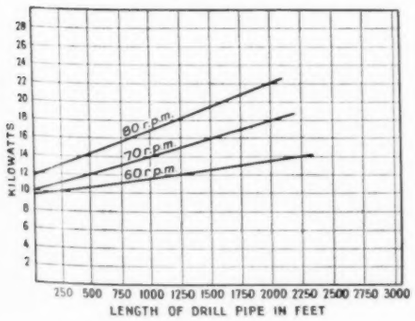


Diagram II. 4-inch drill pipe, 8-inch bit, no load on bit

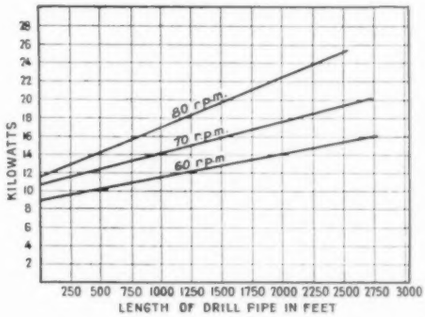
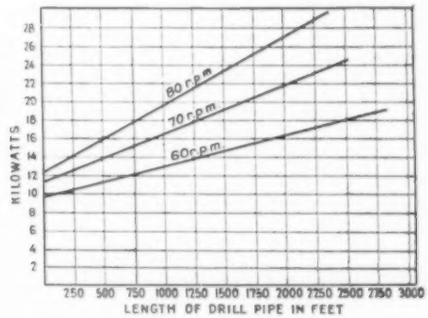
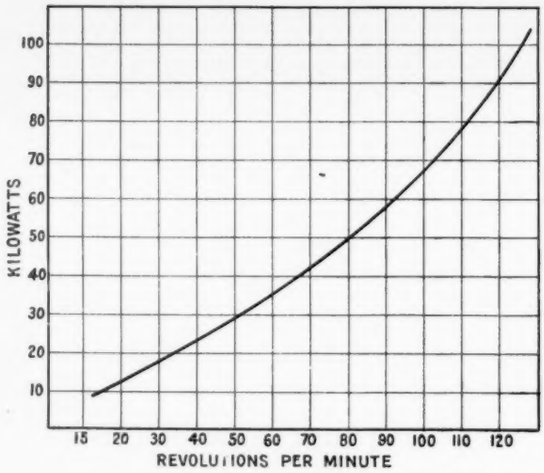


Diagram III. 4-inch drill pipe, 12¾ inch bit, no load on bit





Loss of power in relation to revolutions
Diagram IV. 6-inch drill pipe, 15¾-inch bit; 1,700 ft. depth, no load on bit

also increase the loss in the power drive.

Table I which, like the diagrams, is the result of special experiments made in Baku, Russia, shows numerical results in kw. of rotary drilling in different formations.

Diagram IV (fig. 4) shows the loss of power in relation to speed of rotation at constant depth, and demonstrates very clearly that in using the rotary system we are limited in the choice of the revolutions per minute. Yet some rocks require an increase of the angular speed of the drill, as for instance, in sticky shale which adheres to the bit.

Second of the defects of the rotary drilling system is the big wear of different parts of the system, such as the pipes, tables, cables, chains, etc. And third, as is well known, is the difficulty during rotary drilling of feeling the changes in the drilling formations and of determining the geological cross-section.

The causes of crooked holes are various, and we will discuss them under seven headings as follows:

1. When drilling in strata which are horizontal, the bit will tend in the direction of the stratum of lesser hardness. This fact is very well known and need not be further referred to. Let us only notice that if the strata are inclined the deviation of the bit can become very great, especially when the strata possess different hardnesses.

2. In some cases, crooked holes can be produced by bad operation of the pump, which is the most important item in all the processes of hydraulic drilling. Poor operation of the pump leaves on the bottom of the hole large pieces of rock which greatly hinder the process of drilling, especially when the pieces are hard.

3. The form of the cutting apparatus of the tool.

Spiral Deformation

4. In rotary drilling the transmission of power is performed by a very thin vertical axis, the diameter of which is ordinarily between 1/20,000 and 1/30,000 of its length measured from the rotary table to the bottom of the bored hole. Mechanics teach that the straight form of such an axis is very unstable and can be easily disturbed by small influences. When the straight form of the axis is disturbed, there is a tendency for the hole to become crooked.

If one holds a thread by its two ends and twists it, when the torsion becomes sufficiently great the thread will be deformed more or less into a loop or spiral. Similar deformation of the drill pipe is often the real cause of the destruction of the metallic thread—and not an excessive twisting moment in relation to the resistance of the material of the thread.

Obviously it is very necessary to determine the value of the twisting moment M_k in order to conserve the threads under such distortion. If the moment M_k be small the axis will retain its original straight form, but as the moment M_k becomes greater the deformation of the axis will increase.

Let us suppose that our metallic vertical cylindrical axis initially coincides with the axis OZ (fig. 5). Let us make a section mn

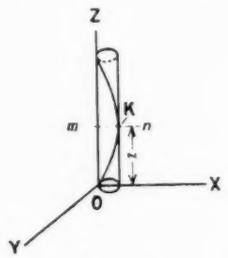


Figure 5

at a distance z from the axis OX and let us suppose that in this section we have a twisting moment M_k which deforms the axis into a spiral. This moment can be represented in the form of a vector parallel to the axis OY and acting in a plane perpendicular to this axis.

Let us divide the moment into two components, one of which will be tangent to the spiral and the other perpendicular. The first component will cause a twisting stress, while the second will, if great enough, cause and maintain a deformation of the cylindrical axis.

Let us denominate by α, β, ν the angles formed at the point K by the tangent to the spiral and the axis of coordinance, and let ds represent the element of length of the spiral. In this case we will have obviously

$$\cos \nu = 1$$
$$\cos \alpha = \frac{dx}{ds}$$
$$\cos \beta = \frac{dy}{ds}$$

If we decompose the moment M_k we shall have

$$M_x = M_k \cos \alpha = M_k \frac{dx}{ds}$$
$$M_y = M_k \cos \beta = M_k \frac{dy}{ds}$$

The moment M_k, the direction of which is parallel to the axis OY, has a tendency to produce a deformation of the cylindrical axis in a direction perpendicular to the axis OX. The double curvature of the elastic line is a result of the combined action of both the two components of the moment, and it is possible to observe the action of both components separately and to sum them.

$$EJ\frac{d^2x}{dz^2} = +M_y = M_k\frac{dy}{ds}$$
$$EJ\frac{d^2y}{dz^2} = -M_x = M_k\frac{dx}{ds}$$

The angle $\frac{dy}{ds} = \frac{dy}{dz}$ is very small, and we can admit that

$$EJ\frac{d^2x}{dz^2} = \mp M_k\frac{dy}{dz} \quad \ldots\ldots(1)$$
$$EJ\frac{d^2y}{dz^2} = \pm M_k\frac{dx}{dz} \quad \ldots\ldots(2)$$

By integrating the expression (1) we find:

$$\frac{dx}{dz} = \pm\frac{M_k Y}{EJ} \pm C$$

Substituting this expression in the formula (2) we find

$$EJ\frac{d^2y}{dz^2} = -\frac{M_k^2 Y}{EJ} - CM_k \quad \ldots\ldots(3)$$

Knowing C from the limiting conditions we find that the solution of the last equation corresponds to the analogous equation of Euler for cases of longitudinal bending, and the root of this equation will be

$$Y = A\sin\beta z + B\cos\beta z - \frac{C.EJ}{M_k} \quad \ldots\ldots(4)$$
$$\beta = \frac{\pm M_k}{EJ} \quad (b)$$

If $Y = 0$ and $z = l$, where l is the length of the cylindrical axis, we find by substituting those values in the equation (4)

$$B = C\frac{EJ}{M_k} = \frac{C}{\beta}$$
$$A = \frac{C}{\beta}\cdot\frac{1-\cos\beta l}{\sin\beta l}$$
$$Y = \frac{C}{\beta}\left[\frac{\sin\beta.x}{\sin\beta.l}(1-\cos\beta.l) + \cos\beta.z - 1\right] \ldots(5)$$

By differentiating this equation twice and substituting its second derivative in the equation (4) we get:

$$\frac{d^2y}{dz^2} = -C\beta\left[\frac{\sin\beta.z}{\sin\beta.l}(1-\cos\beta.l) + \cos\beta.z\right] = -\beta\frac{dx}{dz}$$

Integrating this equation gives:

$$X = \frac{C}{\beta}\left[\frac{\cos\beta.z}{\sin\beta.l}(\cos\beta.l - 1) + \sin\beta.z\right] + K \ldots(6)$$

If $X=0$ and $z=l$, the first final condition makes it possible to determine K from the equation (6)

$$K=\frac{C}{\beta}-\frac{1-\cos\beta.l}{\sin\beta.l}$$

If we substitute the second final condition we get:

$$X=O-Z=l$$
$$O=C\left[\frac{(\cos\beta.l-1)^2}{\sin\beta.l}+\sin\beta.l\right]$$
$$(\cos\beta.l-1)^2+\sin^2\beta.l=O$$

Whence we have:

$$\sin\beta.l=0$$
$$\cos\beta.l=1$$
$$\beta l=2\pi$$
$$\beta=\frac{2\pi}{l}$$

If we substitute β in the equation (4) we find

$$M_k=\frac{2\pi EJ}{l} \quad or \quad l_k=2\pi\frac{EJ}{M}$$

In this way we discover the length at which an axis of a given section begins to deform. This length is called the Critical Length

$$l_k=2\pi\frac{E\pi d^4}{64}\cdot\frac{16}{\pi.d^3.k_t}=\frac{1}{2k_t}\ E\pi d$$

E is here the modulus of elasticity, d the diameter and K_t the admissible tension. For a solid round steel axis (not tubular) $l_k=3000\ d$ theoretically. Practically, because of lack of homogenity of the material this factor has to be diminished.

If $K_t=1000\ kg./cm^2$ and $E=2{,}000{,}000$, then for pipes

$$l'_k=2\pi\frac{E\pi(D^4-d^4).16}{\pi(D^3-d^3).64k_t}$$

Where $D=$ outside diameter and $d=$ inside diameter, and $\frac{D}{d}=\alpha=1.2$ (for example)

$$l_k^{pipe}=\frac{E\pi}{2K}\cdot\frac{\alpha^4-1}{\alpha^3-1}d=3000d$$

Where the modulus of twisting is G and the polar moment of inertia is equal to two equatorical moments $J_0=2J$, the angle of twisting, as it is known, is

$$\gamma=\frac{M_k.l}{G.J_o}=\frac{M_k.l}{2GJ}$$

Substituting in this expression the value of M_k from the equation (3) we find that

$$\gamma=\frac{2\pi EJ.l}{2G.J.l}=\frac{\pi E}{G}\ldots(7)$$

It is known that the ratio between the coefficients of normal and of transversal elasticity is $m=1/4=0.25$ if the coefficient of Poisson is $\frac{E}{G}=(m+1)2=\frac{5}{2}$

Substituting $\frac{E}{G}=\frac{5}{2}$ in the expression (7) we find that $\gamma=2.5\pi$ or, in other words, that the deformation of the axis from the vertical will begin when the twisting angle exceeds 2.5π or 450°.

It is thus clear that a long axis can be spirally deformed under certain conditions even in the absence of any vertical load—therefore when no real drilling is being done and the drill pipes are only rotating.

The Critical Length is 3000 diameters. If we drill with 4-inch drill pipe the Critical Length is $3000d=3000\times4''=12{,}000''=1000$ ft. With drill pipe of 6 inches diameter, the Critical Length is 1500 ft. Hence it will be noted, greater rigidity decreases the chances of deviation of the holes.

Deformation under Load

5. The natural desire to speed the rate of drilling has provoked in Russia as well as in the United States a system of working with a heavy load on the bit, especially when drilling in hard rocks (sandstones, etc.).

American practice has demonstrated that for successful drilling in hard sandstone, the necessary pressure is 1000 lb. per inch diameter of the bored hole.

Professor Uren states that American practice has established it is possible in the case of 6-inch drill pipe to work with the full load of the weight down to a depth of 250 ft. When the depth of the hole reaches 3000 ft., 1/8th of the weight of the pipe presses upon the bottom and 7/8ths are suspended on a hook. In this way we have an exceedingly thin axis (fig. 6) expanded in its part AB and compressed in the part BC. During the drilling, the bit at the bottom of the bored hole receives from the motor at the surface the moment M_1. This moment meets a reaction M_2-E, due to which the lower end of the axis is under the influence of an equal but opposite moment $M_1=M_2$.

Figure 6

Denominate by $Q=qL$ the weight of the axis (drill pipe), where q is the unit weight and L is the length of the axis.

One part of the weight of the stem $BC=G$ is transmitted to the bottom of the bored hole and creates a load which is counterbalanced by the reaction on the bottom. The condition of equality of the vertical forces is represented by the formula

$$P+G=Q.$$

In order to calculate this case, we will apply Greenhill's formula, which is generally used for long axes which are simultaneously twisted and compressed (steamer shafts).

$$\left(\frac{M}{2EJ}\right)^2=\left(\frac{\pi}{L}\right)^2\pm\frac{P}{EJ}\ldots(8)$$

where E is the modulus of elasticity and J is the equatorial moment of inertia.

If we denominate the rigidity $EJ=B$ and substitute its value in the equation (8), we find

$$\left(\frac{M}{2B}\right)^2=\left(\frac{\pi}{L}\right)^2\pm\frac{P}{B}$$

Because the major part of the axis AB is elongated, it is possible to change the elongation load by a single force applied at the upper point A. This force will equal one-half of P, or in other words $P_1=P_2$. The compressed part of the axis BC is small in comparison with the length of the axis AC, and we can suppose, without great error, the force P divided by 2 is applied at the point C.

Now, Greenhill's equation can be written as follows:

$$\left(\frac{M}{2B}\right)^2=\left(\frac{\pi}{L}\right)^2+\frac{P}{2B}\ldots(9)$$

Having that $P+G=qL$, therefore $P=qL-G$, and substituting in the equation (9) we obtain

$$\left(\frac{M}{2B}\right)^2=\left(\frac{\pi}{L}\right)^2+\frac{qL-G}{2B}\ldots(10)$$

This gives us the value of the Critical Moment as a function of the length of the axis and of the pressures upon the bottom of the bored hole. This moment is evidently proportionate to the load upon the bottom. The bigger the moment the bigger is the load.

In order to find the Critical Moment, i.e., the moment which for a given length of the axis and for a given load begins to deform the axis, we will apply the ordinary

method which consists in equating the first derivative with zero.

$$-\frac{2\pi^2}{L^3}+\frac{q}{2B}=0$$

$$\text{Therefore } L^3=\frac{4\pi^2B}{q}$$

Substituting this in equation (10)

$$M^2=\frac{4\pi^2B^2}{L^3}\cdot L+\frac{qL-G}{2B}\cdot 4B^2$$

$$=LB\frac{4\pi^2B}{L^3}+2B(qL-G)$$

$$Since\ \frac{4\pi^2B}{L^3}=q\ and\ Q=qL$$

$$M^2=LBq+2B(Q-G)$$

$$=B(3Q-2G)\ldots(11)$$

The minimum critical value of the moment will be:—

$$M=\sqrt{B(3Q-2G)}\ldots(12)$$

and the pressure G on the bit at the bottom of the hole will be:

$$G=\frac{3BQ-M^2}{2B}\ldots(13)$$

Eccentricity of Pipe

6. Drill pipes have nearly always some eccentricity, which means that the center

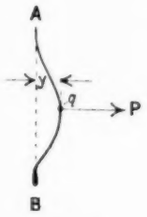


Figure 7

of gravity does not coincide with the axis of rotation, thus producing a deformation of the axis by the centrifugal force (fig. 7).

$$P=\frac{q\omega^2y}{g},$$

where q is the unit of drill pipe,
g is acceleration due to gravity,
ω is angular velocity,
y is eccentricity of the drill pipe.

Torsional Vibrations

7. Drilling with a long vertical axis there arise torsional vibrations due to rapid changes of twisting deformations. Torsional vibrations can induce great stresses. The smallest period of these vibrations will be $T=2\frac{l}{C}$ where l is the length of the axis and $C=\sqrt{\frac{E}{S}}$ is the velocity of extension of the vibrations, which are equal to the velocity of the tone (E being the modulus of elasticity and S being the density of the material).

From these discussions it will be seen that crooked holes are the result of the method itself of rotary drilling. Holes can go crooked even in a perfectly homogeneous medium and in perfectly horizontal strata.

Mexico Confirming Oil Land Titles

MEXICO CITY.—Further aid to petroleum companies operating in Mexico, especially to the larger enterprises which of late have shown an inclination to increase their activities, is promised by Luis L. Leon, Minister of Industry, Commerce and Labor, in a statement just issued. Minister Leon declares that such companies, in so far as heavy petroleum production is concerned, are to have confirmatory concessions establishing the validity of their titles, "disposed of within a period of not longer than two months." Minister Leon's statement follows in part:

"To date, the number of applications filed for concessions is 3484. Included in this number are those for confirmation of rights before the Constitution of 1917 went into effect, as well as those for preferred and ordinary concessions. Confirmed concessions cover tracts with a total area of 24,000,000 hectareas (92,300 sq. miles), and ordinary and preferred concessions a total area of 48,000,000 hectareas (184,600 sq. miles). Therefore, in round figures, the Ministry of Industry Commerce and Labor has received to date applications for petroleum concessions which cover a total area of 72,000,000 hectareas (277,000 sq. miles).

"From the date when the study of the first requisites was completed within the jurisdiction of the regulation in force, until the present time, titles of petroleum concessions of a confirmatory nature have been extended to approximately 7,500,000 hectareas (29,000 sq. miles) and of an ordinary nature to approximately 3,500,000 hectareas (13,500 sq. miles), or a grand total of about 11,000,000 hectareas (42,400 sq. miles).

"So far it has only been possible to analyze ordinary and preferential applications for concessions to the extent of just a small part of those presented."

Minister Leon speaks of the larger companies operating in Mexico and which are members of the Association of American Petroleum Producers in Mexico as a group deserving special attention because these enterprises "established petroleum exploitations."

"These companies," the statement asserts, "would have the greatest reason to make complaints about damage caused by the slowness of procedure relating to their consessions. Of the 250 confirmatory concessions in which these large companies have been interested for the past four years, it may be stated that the majority of cases have already been decided. There remain under consideration at the present time something like 50 concessions, which will be disposed of within a period of not longer than two months.

"The reason why all these cases, especially those of the larger companies, have not all been disposed of, is that their examination involves a great amount of very careful documentary, technical and legal work, as may be readily understood, and the staff assigned for this work has not previously been able physically to handle it. However, we can say that the staff which deals with these cases is now fully organized and can therefore give expeditious attention to these matters."

This statement serves to recall the controversy which was waged by the governments of Mexico and the United States a few years ago over the petroleum situation. The solution was brought about by the arrival here of United States Ambassador Dwight W. Morrow. His negotiations to bring about a satisfactory arrangement of the matter for all parties concerned resulted in the passing of a new oil law during the administration of President Calles in March, 1928. One of the chief features of this statute was that the petroleum companies were to file applications for confirmatory concessions, to be granted them in perpetuity instead of for the 15 years specified under the old law which the companies had declined to accept—an action which placed them in the position of defaulting their rights in the eyes of the government.

DOUGLAS GRAHAME.

Prevention of Industrial Accidents

Corroboration of Important Financial Savings Attainable by Oil Companies Through Well Organized Accident Prevention Activities

By H. N. Blakeslee
Petroleum Representative
National Safety Council

A LEADING COMPANY in the petroleum industry of the United States paid out $18.01 per payroll employee for industrial accident claims in 1920. Through the study and application of safety principles this same company was able in 1927 to cut its industrial accident claims to $7.82 per payroll employee. Through the same means, another large petroleum company was able to cut its cost of industrial accidents from $15.25 per payroll employee in 1926 to $8.30 in 1927.

In recent years the petroleum industry of the United States has accomplished more than any other great industry in the assembly and distribution of prevention information against specific accidents arising from ignorance, carelessness or neglect of employees.

This has been achieved by the activities of the safety departments of many individual companies, supplemented by a nationwide accident prevention service conducted for eight years by the petroleum industry through the medium of the Petroleum Section of the National Safety Council, with financial aid from the American Petroleum Institute.

Individual petroleum companies have been able greatly to reduce the number and the cost of their industrial accidents. This, of course, has prevented or relieved a great deal of individual suffering among petroleum employees in all branches of the industry. This accident prevention work directly touches every day at least a quarter million of the one and one-half million employees of the industry. It has also been proved a good business investment on the part of individual petroleum companies.

The experience of the two companies cited in the opening paragraph is considered to be far more favorable than the average because of their special interest and activity in accident prevention work over a number of years.

In contrast, some petroleum companies are paying at least $40 annually per payroll employee as the cost of industrial accidents. The average cost of accidents per payroll employee for the entire industry can be conservatively assumed as not less than $15 per year.

Based on an estimate of 1,500,000 employees in the petroleum industry in the United States and assuming $15 as the minimum cost per payroll employee, the North American petroleum industry is expending over $20,000,000 annually for industrial accident claims. This figure does not include other losses incident to the injuries, such losses, for example, as damage to property, loss of time on the part of sympathetic employees at the time of the accidents, and the stoppage of machinery and equipment. These additional "incidental costs" of accidents may be conservatively estimated as four times the cost of the original claims. Therefore the total cost of industrial accidents in the petroleum industry of the United States may be assumed as not less than $100,000,000 annually. Hence, there are possibilities of important financial savings by all individual oil companies through well organized accident prevention activities.

Large Monetary Savings Demonstrated Possible

Another proof of cash savings through accident prevention work is derived from the results of the first two Petroleum Section safety contests organized and conducted by the National Safety Council in the last two years.

The first nation-wide competitive safety contest in the petroleum industry began on Feb. 1, 1928, and continued through a period of six months. Entries were made by units, a unit being a subsidiary company, a localized division or a refinery. A total of 98 units involving over 80,000 workers entered the contest.

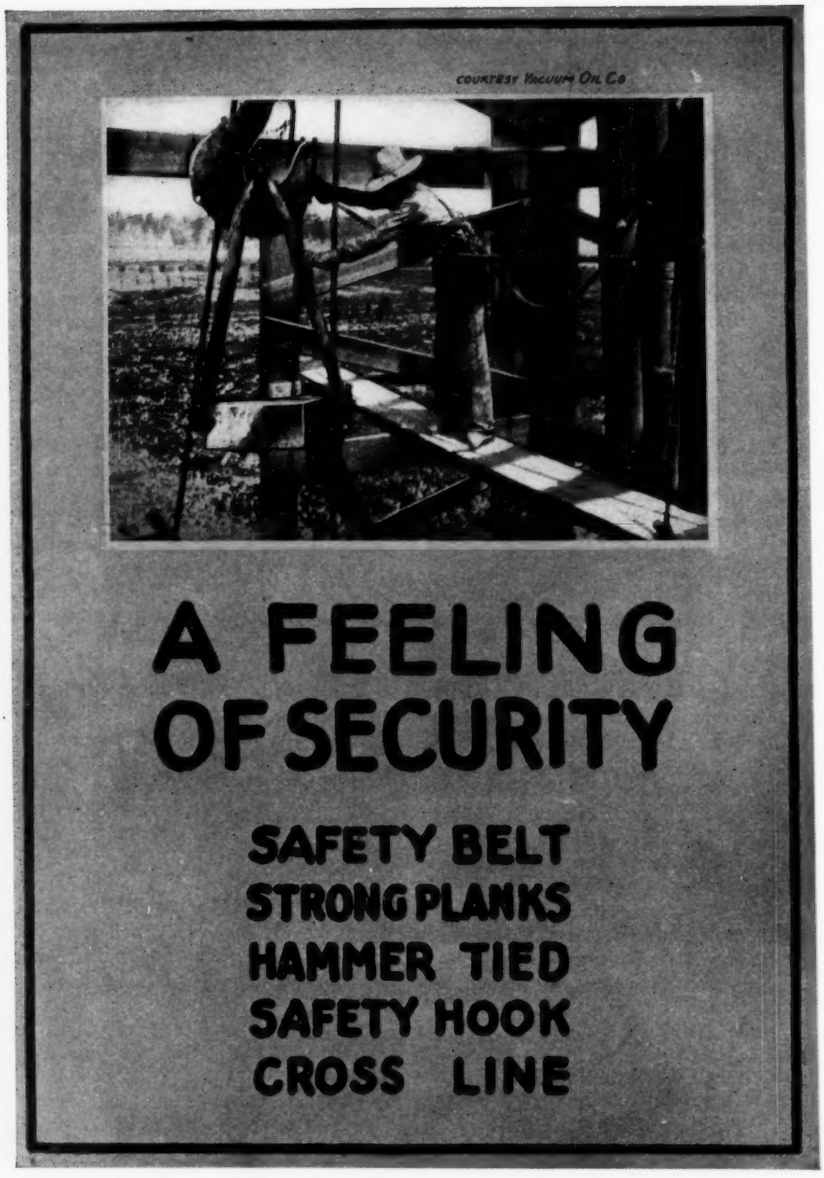
The 1929 Petroleum Section safety contest started on Jan. 1, 1929, and continued also for a period of six months. In the second contest a total of 180 units, in six different divisions, were entered, representing a total of 146,596 petroleum workers, an increase of about 80 per cent over the previous contest. The accident rate for the 1929 contest—that is, the number of lost time accidents per 1,000,000 man-hours worked—represented a reduction of 8½ per cent as compared with the 1928 safety contest. This reduction meant the saving, on a comparative basis, of 458 lost time accidents. One petroleum company which took part in the contest has figured that the average cost of a lost-time accident is $250. At this rate the 1929 safety contest represented a total saving of about $115,000 in addition to the saving of inconvenience and suffering to workers.

The 1929 contest produced some quite remarkable results. Seven of the eleven class winners had accident frequency rates of 0—that is, during the entire six-months period none of these seven establishments had a single lost-time accident to report on their record.

The winner in the Manufacturing Division, Class A, was the Wood River Refinery, Standard Oil Co. of Indiana, with a daily average of 1,053 employees and an accident frequency rate of 0. The Vacuum Oil Co., employing 3,900 men, went through the contest with only 12 lost-time accidents. It is also remarkable that the Humble Oil & Refining Co., engaged in production operations in the Oklahoma oil fields, with 218 men, went through the six months without a single accident causing a loss of time. The Midwest Refining Co., with some 769 employees in its producing department, registered only 8 lost-time accidents. The Skelly Pipe Line, with 103 employees, had not had a lost-time accident since Oct. 27, 1928, to the close of the contest on June 30, 1929.

Accident Prevention Movement Spreading

The accident prevention program in the petroleum industry of the United States has had gradual development. Some refineries have conducted organized accident prevention work for at least 10 or 12 years. All of the leading petroleum companies of the United States, for five or six years, have been training men in First Aid and have been conducting some sort of safety meetings, usually through a specialized safety department under the immediate supervision of a safety engineer. Accident prevention work was first undertaken in the producing fields and was started there about 7 or 8 years ago, but the most important step toward re-



Poster in two colors. Picture, lettering and frame in black, on orange tint

duction of accident losses in the petroleum industry as a whole came about three years ago as the result of an appeal by petroleum safety engineers of the United States to the American Petroleum Institute. These safety engineers asked for help in the solution of their accident prevention problem. The American Petroleum Institute realizing that industrial accidents were costing the petroleum industry many millions of dollars annually and appreciating that this cost could be greatly reduced, began seeking for the most feasible plan to assist in accident prevention work.

In 1922 the National Safety Council had formed a Petroleum Section, and most of the leading petroleum companies of the United States were members. Because an accident prevention service for the petroleum industry had already been established, and because of the years of experience of the National Safety Council, the A. P. I. decided it could best serve the petroleum industry by providing funds for more extensive specialized work in this field by the same agency. Accordingly, in May, 1927, a full time petroleum safety engineer was employed by the National Safety Council, his activities to be financed by the American Petroleum Institute.

The man who was selected to fill this position and who has been supervisor of this work continuously ever since, had had about 16 years of experience in petroleum operations. This included about 9 years of personnel and accident prevention work, and 7 years in oil industry trades. This petroleum representative, in order further to familiarize himself with the accident prevention problem, devoted several months to a study of it throughout the petroleum industry of the U.S.

Safe Practices Broadcast

One of this representative's activities has become the production of Petroleum Section Safe Practices pamphlets. This is done through the engineering committee, consisting of a chairman and six committeemen representing the six geographic divisions in the Petroleum Section. These men are capable petroleum safety engineers.

Each Safe Practices pamphlet contains information relating to a specific job, telling how such work may be done safely. The first draft of a Safe Practices pamphlet is developed by one of the members of the Engineering Committee in consultation with other petroleum safety engineers. It is then submitted to all companies in the petroleum section for comments and suggestions, the substance of which is incorporated in the revised final draft before publication.

Up to the present time seven of these pamphlets have been completed: 1. Safe Practices in Pulling Wells; 2. Safe Sales Truck Driving; 3. Safe Practices in Loading Tank Cars (Gasoline); 4. Safe Practices in Handling and Laying Pipes; 5. Safety in Gasoline Service Station Operations; 6. Safe Practices in Cleaning Petroleum Stills; 7. Safety for the Oil Field Pumper.

They have had wide circulation throughout the industry in the United States and over the entire world. One of them, "Safe Sales Truck Driving," is being translated into Spanish for use in South America by several large company members of the National Safety Council.

Mr. C. W. Smith, chairman of the section, has summarized the value of these pamphlets as follows:

1. They are of benefit to the engineer unfamiliar with particular operations.

2. They are a source of information to the new foreman in his job.

3. They provide the superintendent with information whereby he can give his foreman specific instructions regarding accident prevention on a specific job.

4. Reading the pamphlets will more definitely clarify the mind of the experienced worker as to what to do to prevent accidents in the course of his work.

5. They furnish the new man with information regarding his own self-protection and the protection of his fellow workers that in the past has sometimes been gained through costly experience.

6. The information should be of interest and value to clerical help conducting cause classification of accidents.

One large petroleum company has distributed a great many copies of these pamphlets among its foremen and supervisors. They report that for several years they had been keeping their workmen informed in a more or less haphazard manner about the various risks peculiar to special jobs, but they had never assembled all of this information compactly.

Another company, which conducts extensive marketing operations in 22 states, gives chief credit to the use of the pamphlet "Safety in Gasoline Service Station Operations" for a 55 per cent reduction in industrial and public accidents during the first six months of 1929.

Liability Claims Reduced

A large petroleum company through the organization of accident prevention work in its sales department and through the use of the Petroleum Section pamphlets has been able to reduce its industrial accident and public liability claims about 75 per cent within three years. A number of other companies have reduced like accident costs at least 50 per cent within the last three years.

"As soon as possible after the publication of 'Safety in Gasoline Service Station Operations,'" reports a city division of one large petroleum company, "we secured copies of this pamphlet, distributing them to all service station supervisors and then to all service stations. This was followed by the use of the film strip (a series of pictures dealing with safety in service station operations) at meetings of service station supervisors and of station salesmen. The results could be noticed almost at once. Reports of unsafe conditions and unsafe equipment at service stations began coming in. The conditions complained of were remedied by the safety supervisors whenever possible, even before instructions were issued. Major accidents in the service station departments stopped almost entirely and minor accidents decreased appreciably."

Another important activity of the Petroleum Section is the publication of a monthly news letter. Its purpose is to carry to all key men in the industry current accident prevention news and practical safety suggestions. The letter is usually sent to foremen and superintendents, and sometimes they are routed even to "gang pushers." The chairman of each of the six geographic divisions of the United States is responsible for two news-letters each year, which thus provides for a regular monthly issue and news from all parts of the country.

A new educational service in accident prevention has been introduced in the form of projector film strips. The Petroleum Representative, during his visits with petroleum companies, takes or secures many pictures to illustrate accident hazards and safety practices. Thus, 57 photos were selected to form the first film strip, called "Safety in Gasoline Service Station Operations." Many petroleum companies are now using the film strip for the instruction of their service station supervisors and service station salesmen. A second film strip is "Safe Sales Truck Driving"; and a third is "Safety for the Oil Field Pumper."

Safety posters are an important form of instruction for workers in accident prevention. More than 100 such posters have already been produced, and two new

Two-color poster. Picture, upper lettering and middle panel in black, on cerise tint

ones are being produced each month. It is estimated that a quarter million petroleum workers see these posters daily.

The competitive safety contests have had great value for stimulating interest in accident prevention. They have the additional value of developing plant loyalty and a splendid quality of working cooperation between management and employees. The 180 units, representing nearly 150,000 petroleum workers, which participated in the 1929 contest were divided into six divisions, including manufacturing, marketing, producing, natural gas-gasoline, pipe line, and marine. Within each division, excepting the marine, there were Class A entries, representing the larger competing units, and Class B entries, representing the smaller units. National Safety Council is worldwide, though a large percentage of the members, of course, are in the United States. In the petroleum industry, many companies and units of companies operating in different parts of the world are served.

The National Safety Council is a cooperative, non-profit-making organization with an annual budget of about $850,000. The membership of the National Safety Council is world-wide, though a large percentage of the members, of course, are in the United States. In the petroleum industry, many companies and units of companies operating in different parts of the world are served, and especially in the oil fields of Mexico and South America. During 1928, the National Safety Council distributed approximately 2,500,000 industrial safety posters. Many of these were used outside the United States, often with adaptations to languages other than English.

Clear the way
and drive closer
This Picture shows
1.Skids too long for strength
2.Truck too far from pile
3Too much to walk over

Poster in two colors. Picture, lettering and frame in black on tiger yellow tint